TECHNOLOGY DEPT.

November 13, 1940

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NATIONAL PETROLEUM NEWS

EMULSION DEOILING PROCESS SEPARATES OIL-WAX MIXTURES

New continuous wax deoiling process, replacing wax sweating, operates by centrifuging water emulsions. All equipment for 400-bbl. unit is contained in a boxcar. Page R-402

• • •

PETROLEUM SYNTHETICS HELP 100-OCTANE FUEL PRODUCTION

Page R-409

• • •

GASOLINE ADDITIVE IMPROVES STABILITY, CUTS CORROSION

Page R-416

NEWS IN BRIEF

Defense headlines API meeting; 5 committees appointed to study defense problem of gasoline storage. Page 13.

* * *

API's 1941 lube program to urge 1000-mile lubrication. Page 13.

* * *

Tulsa SAE meeting discusses defense, diesels, and aviation. Page 21.

* * *

All-purpose lubricant proposed in federal specification. Page 25.

* * *

Higher oil taxes seen likely to aid defense. Page 13.

Record seen for 1940 API meeting; Defense Advisor Wilson speaks. Page 13.

* * *

Pennsylvania crudes advanced 15c per bbl. by leading buyers. Page 13.

* * *

Domestic gasoline demand increases 6% in September. Page 25.

* * *

Cole Committee members returned to Congress in Nov. 5 elections. Page 16.

* * *

Amendments to prohibit division of 'gas' taxes passed in 3 states. Page 25.

REFINING TECHNOLOGY EDITION

Morrison
EMERGENCY VALVES ARE YOUR BEST TRUCK TANK INSURANCE
Every truck tank should have the additional protection of reliable emergency valves.
The danger of disastrous fires can be averted if truck tanks are equipped with these protective valves.
Your truck tank manufacturer will be glad to install Morrison emergency valves on your next truck tank.
ANY OF THESE VALVES CAN BE INSTALLED ON ANY TRUCK TANK NOW IN USE. MAKE YOUR TANK AND PRODUCT SAFE WITH THIS EASY INSTALLATION.
Write for full information concerning these valuable valves.
MORRISON BROS. COMPANY
OIL EQUIPMENT HEADQUARTERS
DUBUQUE, IOWA

COMING MEETINGS

NOVEMBER

Missouri Independent Oil Jobbers Assn., Fourth Annual convention, Hotel DeSoto, St. Louis, Mo., Wed.-Thurs., Nov. 27-28.

DECEMBER

Nebraska Petroleum Marketers Assn., Annual Convention, Fontenelle Hotel, Omaha, Neb., Mon.-Wed., Dec. 2-4.

American Institute of Chemical Engineers, New Orleans, La., Mon.-Fri., Dec. 2-6.

New Jersey Oil Trades Assn., Annual Meeting and Banquet, Robert Treat Hotel, Newark, N. J., Thurs., Dec. 5.

Mid-Continent Oil & Gas Assn., Annual Joint Meeting of Standing Committee on State & Local Taxation, and Standing Committee on Federal Income & Excise Taxation, Hotel Tulsa, Tulsa, Okla., Thurs.-Fri., Dec. 5-6.

Kansas Oil Men's Assn., Convention, Hotel Broadview, Wichita, Kans., Mon., Dec. 9.

Petroleum Electric Power Assn., Heidelberg Hotel, Baton Rouge, La., Thurs.-Fri., Dec. 12-13.

National Asphalt Conference, Dallas, Tex., Mon.-Sat., Dec. 9-14.

South Dakota Independent Oil Men's Assn., 22nd Annual Convention, Coliseum Annex Bldg., Sioux Falls, Iowa, Tues., Wed., Dec. 10-11.

Petroleum Electric Power Assn., 12th Annual Meeting, Heidelberg Hotel, Baton Rouge, La., Thurs.-Fri., Dec. 12-13.

Mid-Continent Oil & Gas Assn., Annual Meeting of General Board of Directors, Tulsa Club Roof, Tulsa, Okla., Mon., Dec. 16.

JANUARY, 1941

SAE Annual Meeting (and Engineering Display), Book-Cadillac Hotel, Detroit, Mich., Jan. 6-10.

Oil Trades Assn. of New York, Quarterly Meeting and Dinner, Waldorf-Astoria, New York, Jan. 21.

FEBRUARY, 1941

Kentucky Petroleum Marketers Assn., Fifteenth Annual Meeting and Convention, Brown Hotel, Louisville, Ky., Feb. 18-19.

North Texas Oil & Gas Assn., Wichita Falls, Tex., Feb. 22.

Iowa Independent Oil Jobbers Assn., Des Moines, Ia., Feb. 26-28.

American Petroleum Institute, Division of Production, Southwestern District, Washington-Youree Hotel, Shreveport, La., Feb. 27-28.

MARCH, 1941

American Society for Testing Materials, Hotel Mayflower, Washington, D. C., March 3-7.

National Dixie Distributors, Inc., Fort Worth, Tex., March 10.

American Petroleum Institute, Division of Production, Spring Meeting, Pacific Coast District, Biltmore Hotel, Los Angeles, Calif., March 11.

Indiana Independent Petroleum Assn., 1941 Spring Convention & Refiners' & Suppliers' Exhibit, Hotel Severin, Indianapolis, Ind., March 11-13.

Oil Burner Institute, Progress Exhibition, Commercial Museum, Philadelphia, Pa., March 17-22.

Oil Trades Assn. of New York, Annual Meeting, Waldorf-Astoria, New York, March 25.

APRIL, 1941

American Assn. of Petroleum Geologists, 26th Annual Meeting, Rice Hotel, Houston, Tex., April 2, 3 and 4.

American Petroleum Institute, Division of Production, Wm. Penn Hotel, Pittsburgh, Pa., April 17-18.

Petroleum Industry Electrical Assn., Tulsa, Okla., April 23-25.

Natural Gasoline Assn. of America, Annual Convention, Baker Hotel, Dallas, Texas, April 23-25.

National Petroleum Assn., semi-annual meeting, Hotel Cleveland, Cleveland, O., April 24-25.

NATIONAL PETROLEUM NEWS

NOVEMBER 13, 1940

NEWS

Three Thousand Oil Men Gather at 21st Annual A.P.I. Meeting 13
All Members of Congressional Oil Committee Re-elected 13
New Heavy Duty Motor Oil Discussed by Automotive Engineer at A.P.I. Meeting..... 14
Tanker Picture Wins First Award at A.P.I. Salon... 15
Five Regions A.P.I. Regional Defense Committees to Co-operate with Army and Navy..... 16
Indiana's New Towboat to Operate in Mississippi... 16
Specifications Proposed for All-Purpose Lubricant.. 23
TNEC Discusses 'Basing Point' Price System in Oil Industry 24
Anti-Diversion Gasoline Laws Passed by Three States 25
Gasoline Demand Up 6% in September 25
Tanker Rates Rise Faster This Year Than in 1939... 27
Truck Driver Wins Wage-Hour Suit 27

MERCHANDISING

Proper Maintenance Improves Mileage, Cuts Octane Requirements, A.P.I .Told 29
Engine Performance as Influenced by Ignition-Timing Maintenance 32

MARKETS

Mid-Western 39
Gulf 39
Atlantic Coast 39
Mid-Continent 39
Pennsylvania 39
California 39
Refinery Prices ...40, 41
Seaboard Prices 42
Tank Wagon Prices 43, 44
Crude Oil Prices..45, 46

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WARREN C. PLATT, *Editor and Publisher*
V. B. GUTHRIE, *Managing Editor*

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THIS WEEK WITH NPN

A.P.I. MEETS

NPN has 5 staff writers covering the A.P.I. annual meeting in Chicago this week. Utilizing fast teletype service from its Chicago news bureau, NPN is able to give you in this issue the last-minute news of this important meeting. Three important technical papers discussing how proper maintenance increases gasoline mileage are also reported in this issue. Other A.P.I. papers will be published next week.

DEGREE-DAY

This issue has Degree Day data for October for leading cities, showing how current heating oil season compares with last year's, page 28. These figures may be used by marketers in connection with NPN's Degree Day Charts in determining how their own sales conform to the general trend (See NPN, Sept. 11, 1940, page 35, for chart and how it works). Incidentally, these Degree-Day charts have been reprinted on heavy-duty cardboard and are available at $1 each.

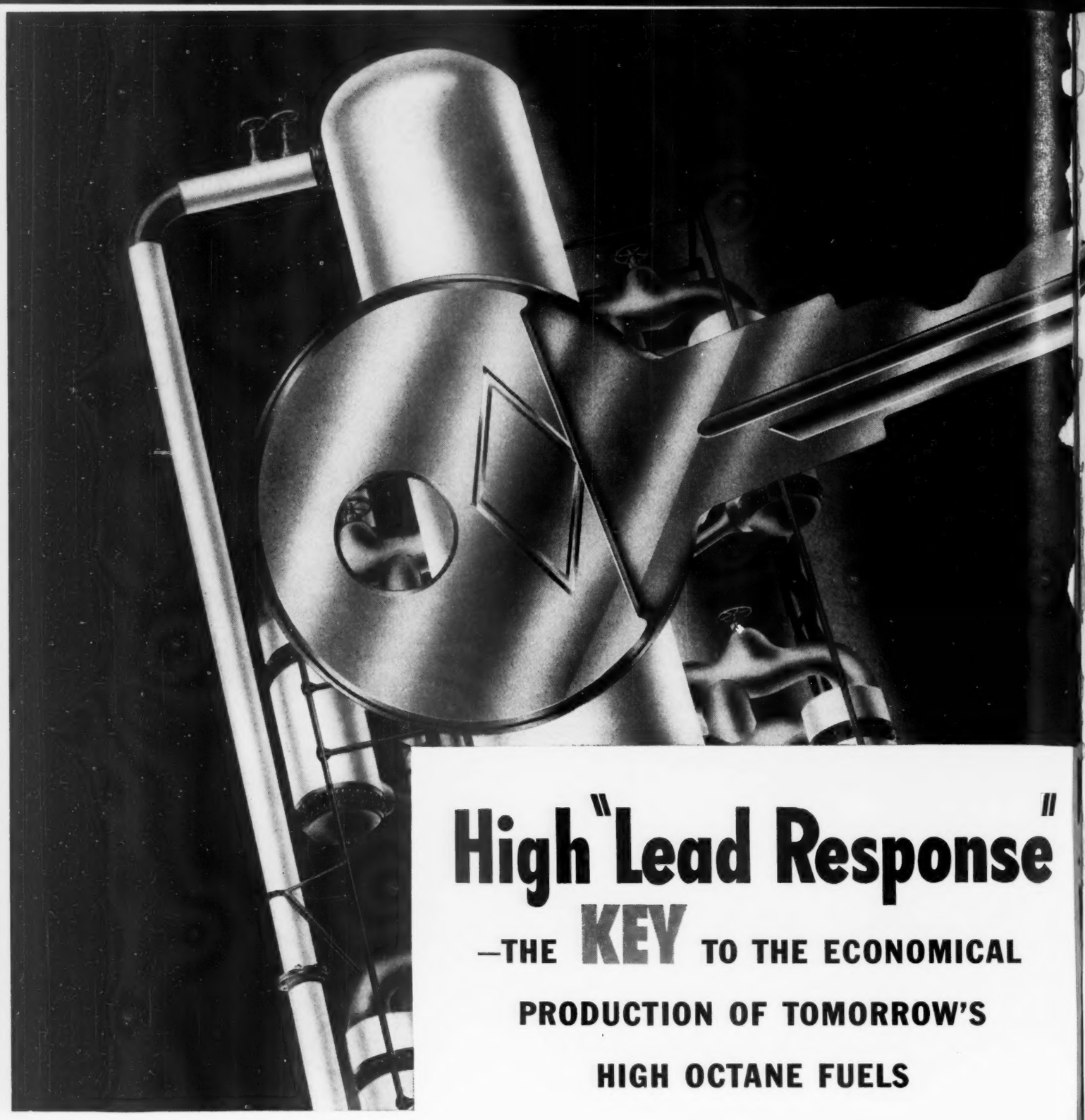
WINTER CHANGE-OVER

NPN's editorial staff welcomes evidence of readers' appreciation of its work. So 4 news writers were glad last Saturday afternoon to pitch in and mail 400 copies of NPN's Winter Change-Over issue (Nov. 6th) as requested by a major company branch sales manager in a telegram received after NPN's mailing department had closed.

NEXT WEEK

"Heavy duty" motor oils is the latest important development in lubricants. So, NPN brings you more news on this subject next week, including a paper and discussion by H. C. Mougey, General Motors technical director, at the A.P.I. meeting.

Sorry that the A.P.I. material this week crowded out the article promised on the Pennsylvania Turnpike, but it will be along later.



High "Lead Response" —THE KEY TO THE ECONOMICAL PRODUCTION OF TOMORROW'S HIGH OCTANE FUELS

Anti-knock levels are not fixed—octane numbers that seem high today will be exceeded in the future. So forward-looking refiners are investigating "lead response" as well as the "clear" anti-knock value of new fuels.

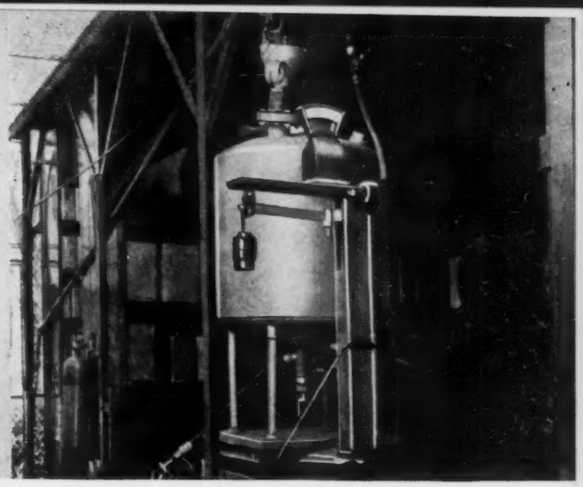
The present trend in the design of all automotive equipment is toward engines of greater and greater efficiency. Manufacturers of passenger cars, commercial vehicles, tractors and aviation engines have steadily raised compression pressures and volumetric efficiency to gain extra power and economy from the improved fuels produced by the petroleum industry. Today automotive engineers are anticipating even further increases in efficiency from tomorrow's fuels.

Thus, the refiner who is planning his gasoline of the future is faced with the problem of adopting a process which will not limit him to an anti-knock level acceptable by today's standards but possibly unsuitable for the engines of the future. For this reason, refiners who take a long-range viewpoint in the selection of refining processes are carefully investigating the "lead response" or "lead susceptibility" of the fuels produced by each

process before selecting new equipment. High lead response may be the key to continued profits over the next several years, as the "high" octane numbers of today's fuels are exceeded in order to keep abreast with progressive developments in engines and fuels.

A process which produces fuel of good lead response permits the refiner, through the addition of tetraethyl lead, to keep pace economically with the continuous trend toward higher octane numbers. By contrast, refining equipment which produces fuel with poor lead response, even though such fuel may have an inherently high anti-knock value, might eventually require extensive modification. The possible cost of such changes should be included in any long-range planning for high anti-knock fuels. The refiner who looks well ahead should give prime consideration, from both a technical and an economic viewpoint, to processes which yield fuels having *both* high anti-knock value and high lead response.

ETHYL GASOLINE CORPORATION
Chrysler Building, New York, N. Y.



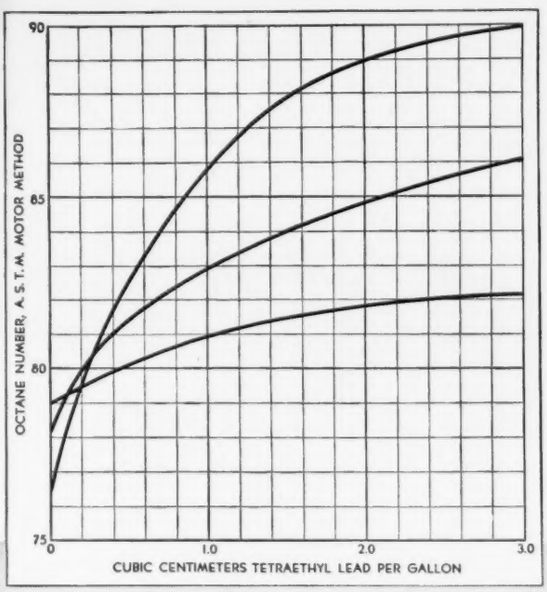
EXPERIMENTAL FUELS, blended in this equipment in the Ethyl Research Laboratories, are supplied to automotive and parts manufacturers for use in their own research activities. Fuels much superior to those now commercially available are essential for many engine development projects which are now under way.

MAKING TRANSPORTATION BETTER AND MORE ECONOMICAL THROUGH RESEARCH

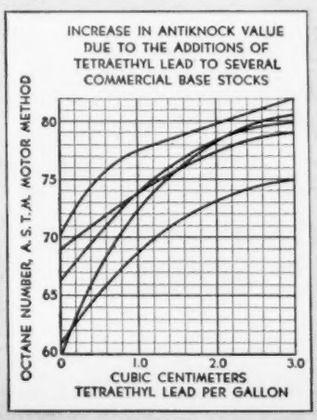
Because the problems of fuels and engines are inseparably related, we of the Ethyl Gasoline Corporation, through our research laboratories in Detroit and San Bernardino, are cooperating with the technologists of both the automotive and oil industries. And through our field engineers we are working daily with the users of fuels and engines in order that the benefits resulting from technical improvements may be most fully realized in service.

Here are some of the lines of research in which the Ethyl Research Laboratories are now engaged:

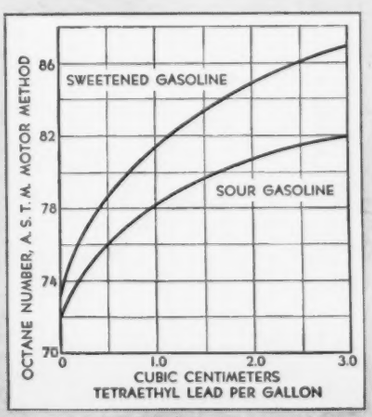
Application of higher compression ratios to commercial vehicles and farm tractors for more efficient utilization of today's improved fuels ★ The development of super compression engines for the utilization of tomorrow's fuels of 90 to 100 octane number ★ Supercharging of passenger and commercial vehicle engines ★ Effect of volatility on anti-knock value ★ Effects of sulfur ★ Anti-knock tests on new fuels ★ Study of the relation of lubrication to fuel and engine developments ★ Pre-ignition ★ Studies of improved ceramics and metal alloys ★ Instrumentation.

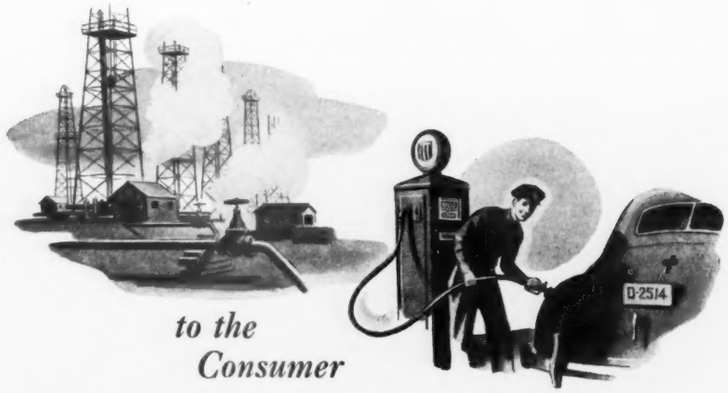


← **LEAD RESPONSE** (*left*) of three types of fuels produced by three new but entirely different types of refining processes. In general, these processes produce fuels of about the same anti-knock value. Yet the lead response of the fuels is entirely different. The fuel of highest "clear" anti-knock value is 2½ octane numbers better than the lowest, but with three cubic centimeters of tetraethyl lead per gallon in each the situation is reversed, and the spread in octane numbers is three times as great. Such variations in lead response are of vital importance to refiners who are now considering the adoption of new refining processes.



SULFUR COMPOUNDS (*right*) adversely affect the lead response of motor fuels. For example, this chart shows the difference in lead response of a gasoline before and after sweetening by a method which removes mercaptan sulfur instead of merely converting it to other sulfur compounds which likewise have a deleterious effect on lead response. Because of the possibility of improving lead response by removal of mercaptan and other sulfur compounds, costs of installing and operating the necessary equipment are being studied by refiners in their planning for the production of higher octane fuels.





From the Well...

to the Consumer

NEOPRENE Is Doing a Bigger Job Than Ever Before!

DOCK LOADING HOSE

NEOPRENE has passed the test of time and use! More and more distributors are specifying this tough, oil-resistant chemical rubber for their hose linings and covers. And in every case they are seeing the result in lowered overhead . . . rock-bottom replacement bills!

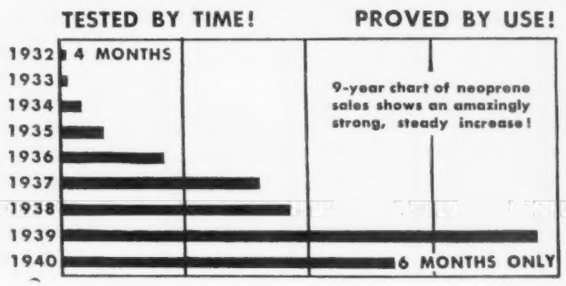
Small wonder neoprene hose linings and covers are fast becoming standard equipment. Neoprene resists the weakening effects of oil and gasoline . . . as well as sunlight, heat, aging, oxidation, even corrosive acids and gases. All this means *indefinite wear* . . . clear-cut savings.

Neoprene is also being widely used for cables, tarpaulins, tool parts, clothing, shoe soles and heels—wherever resilient parts must withstand oil and rough abrasion. Ask your supplier about neoprene. Or write us for a full list of manufacturers.

TANK TRUCK HOSE

FUEL OIL HOSE

GASOLINE PUMP HOSE



DU PONT

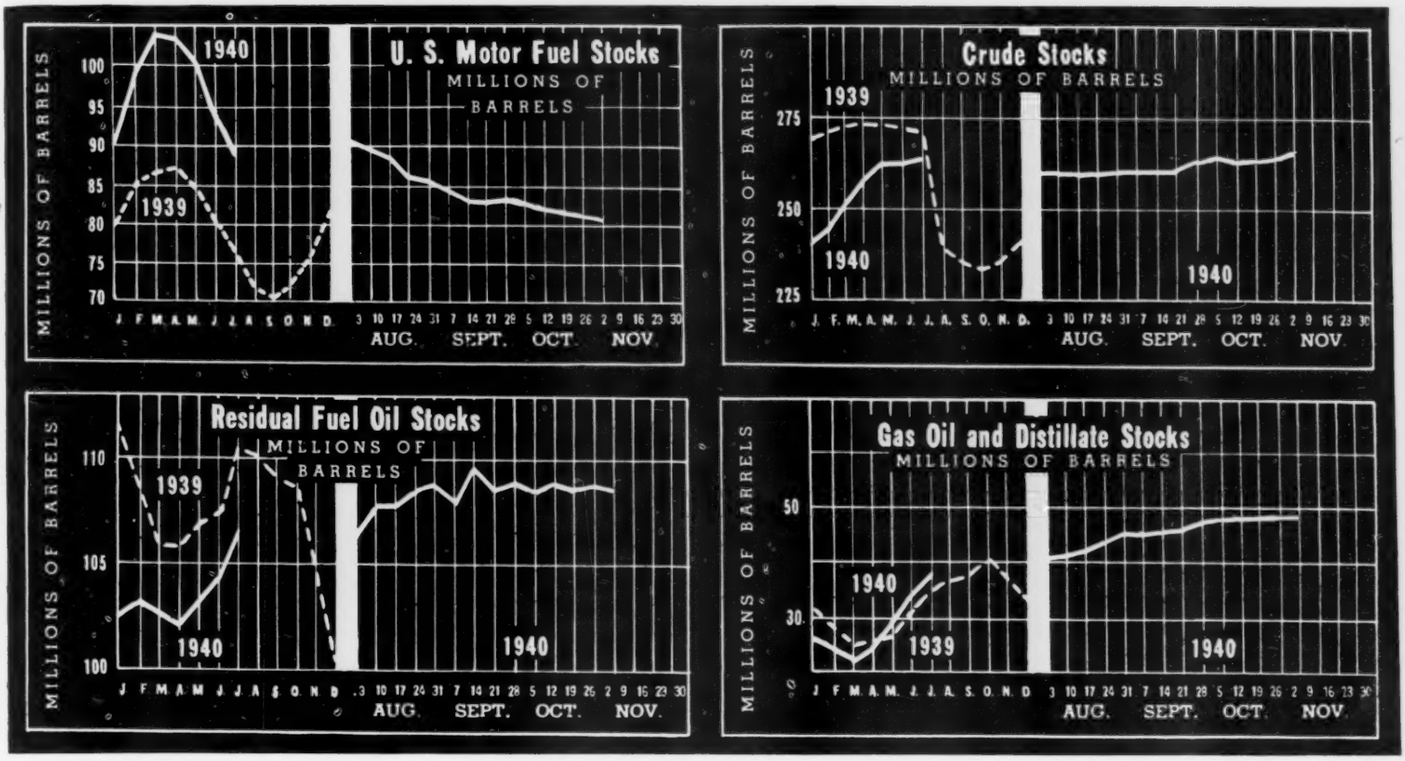
Specify

NEOPRENE

FOR YOUR HOSE LININGS AND COVERS

Du Pont, Rubber Chemicals Div., Wilmington, Del.

LATEST OIL INDUSTRY
· STATISTICS ·



A. P. I. Weekly Refinery Report

(Figures in Thousands of Barrels of 42 Gallons Each)

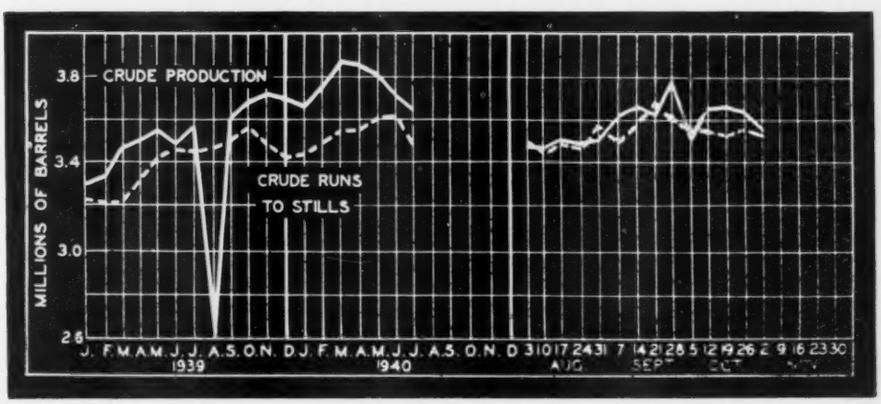
Districts	Daily Average Crude to Stills Week Ended		Per Cent of Reporting Capacity Week Ended		†Gasoline Production Week Ended		Total Stocks Finished and Unfinished Motor Fuel‡ Week Ended		Total Stocks of Gas Oil & Distillates Week Ended		Total Stocks of Residual Fuel Oil Week Ended	
	Nov. 2	Oct. 26	Nov. 2	Oct. 26	Nov. 2	Oct. 26	Nov. 2	Oct. 26	Nov. 2	Oct. 26	Nov. 2	Oct. 26
East Coast	572	598	89.0	93.0	1,548	1,420	18,706	18,958	17,788	17,996	12,952	12,970
Appalachian	117	122	82.4	85.9	434	434	3,246	3,235	598	579	429	490
Ind., Ill., Ky.	596	603	89.0	90.0	2,375	2,282	13,682	13,652	5,705	5,679	3,636	3,620
Okla., Kans., Mo.	247	253	76.5	78.3	§8,900	§8,891	6,205	6,186	1,667	1,654	2,332	2,274
Inland Texas	100	122	59.9	73.1	435	481	1,526	1,600	400	404	1,541	1,565
Texas Gulf	876	858	91.7	89.8	2,730	2,581	13,217	13,103	8,830	8,828	8,788	8,493
La., Gulf	104	110	65.0	68.8	282	284	2,570	2,634	1,408	1,389	1,766	1,868
No. La., Ark.	42	48	80.8	92.3	111	132	470	481	343	335	579	548
Rocky Mt.	35	30	51.5	44.1	214	135	832	806	127	123	400	369
California	505	479	69.2	65.6	1,460	1,349	15,377	15,296	10,564	10,681	73,891	74,378
Total Reporting	3,194	3,223	81.7	82.4	10,489	9,989	75,834	75,951	47,430	47,668	106,314	106,575
U. S. Total **	3,535	3,565	....	....	11,808	11,243	80,774	80,891	48,615	48,893	108,199	108,475
U. S. Total 11-2-39**	3,556	....	....	....	12,293	.....	73,550	.....	39,946	.....	113,749	.....

†Includes straight-run, cracked and natural blended. ‡Includes stocks at refineries, in bulk-terminals, pipe lines and in transit. §12% of reporting capacity in this district did not report gasoline production. **Estimated, U. S. Bureau of Mines basis. *Revised.

Crude Oil Production for the U. S.

(American Petroleum Institute figures)

	WEEK ENDED Nov. 2 Barrels	Oct. 26 Barrels
Oklahoma	395,300	397,200
Kansas	182,700	189,600
Nebraska	1,500	2,600
Texas	1,241,250	1,384,400
Louisiana	282,100	283,150
Arkansas	69,150	68,950
Mississippi	16,700	15,450
Illinois	353,050	343,700
Indiana	20,400	19,100
Eastern (Ill. and Ind. excluded)	92,700	86,950
Michigan	47,150	48,100
Wyoming	69,650	74,200
Montana	18,050	18,200
Colorado	3,500	3,350
New Mexico	101,450	101,450
California	585,300	603,900
Total U. S.	3,479,950	3,640,300
Crude Imports	106,570	123,140
Total New Supply	3,586,520	3,763,440



X VOTE FOR BETTER SERVICE ....AND BETTER QUALITY

Scores of can buyers are turning to Crown for prompt, dependable service on metal containers.

These users find that not only does Crown offer excellent service but a particularly gratifying standard of quality as well. Sturdy construction, handsome lithography and expert assistance by can designers.

In short, your container requirements will be handled to your entire satisfaction at Crown. It will pay you to investigate.

CROWN CAN COMPANY, PHILADELPHIA, PA.

Division of Crown Cork and Seal Company

BALTIMORE ST. LOUIS HOUSTON MADISON ORLANDO
FORT WAYNE NEBRASKA CITY

CROWN CAN

INDEPENDENT AND HELPFUL

· STATISTICS ·

N.P.N. Gasoline Index

	T.W. Dealer	Car Tank
	Cents Per Gallon	
Nov. 12	8.71	5.06
Month ago	8.70	5.12
Year ago	9.64	6.24

Dealer index is an average of "undivided" dealer prices, ex-tax, in 50 cities.

Tank car index is a weighted average of 9 wholesale markets for regular-grade gasoline.

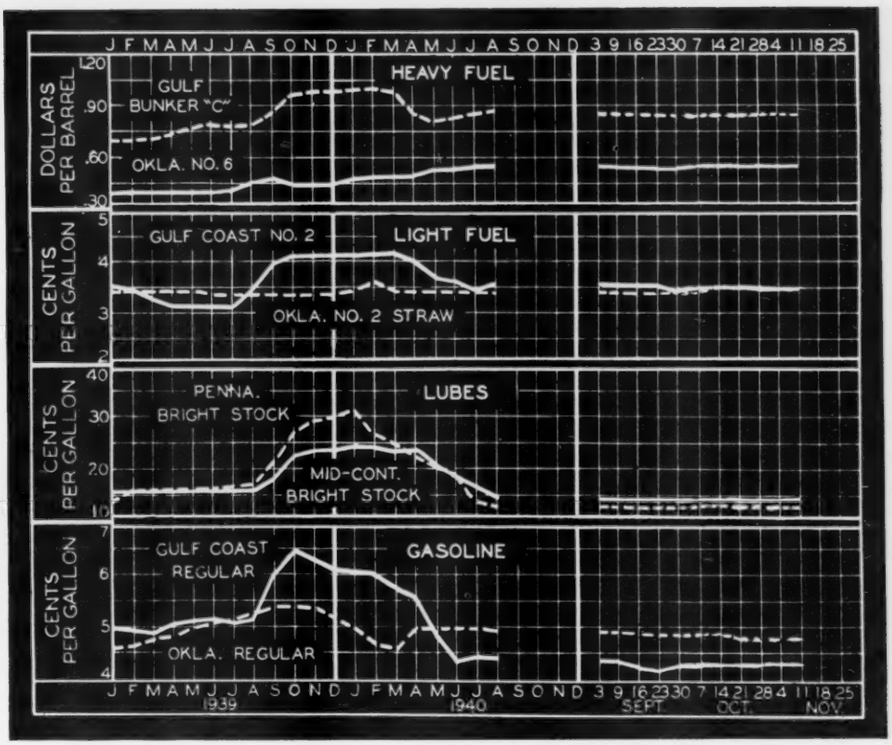
Weekly Changes in Crude Oil Stocks*

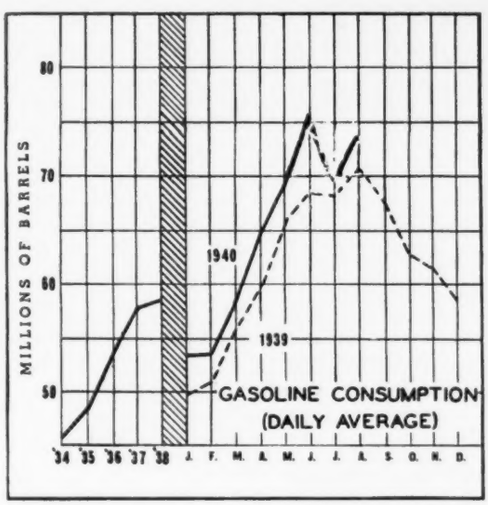
(Thousands of barrels)

Grade or origin	Oct. 26	Nov. 2	Change from Oct. 26
Pennsylvania Grade	4,634	4,656	+ 22
Other Appalachian	1,370	1,390	+ 20
Lima-Michigan	1,477	1,475	— 2
Illinois-Indiana	19,639	19,488	—151
Arkansas	3,576	3,717	+141
Kansas	8,338	8,459	+121
Louisiana:	13,823	14,015	+192
Northern (inc. Miss.)	5,387	5,559	+172
Gulf Coast	8,436	8,456	+ 20
New Mexico	7,620	7,566	+ 6
Oklahoma	64,208	63,721	—487
Texas:	84,155	85,407	+1,252
East Texas	18,976	19,391	+415
West Texas	18,780	18,528	—252
Gulf Coast	20,278	20,464	+186
Other Texas	26,121	27,024	+903
Rocky Mountain	15,998	15,901	— 97
California	35,228	35,626	+398
Foreign	2,680	2,339	—341
Total U. S. refinable	262,746	263,820	+1,074
Heavy in California	12,583	12,397	—186

*As compiled by U. S. Bureau of Mines.

REFINERY TANK CAR PRICES





DEMAND OF ALL OILS*

(Thousands of barrels)

	Sept. 1940	Aug. 1940	Sept. 1939	January-September 1940	January-September 1939
Total demand	119,639	121,130	124,723	1,071,329	1,044,589
Daily average	3,988	3,907	4,157	3,910	3,826
Exports:					
Crude petroleum	4,260	4,170	6,925	40,452	55,147
Refined products	†5,288	6,760	10,797	61,983	90,731
Domestic demand:					
Motor fuel	52,297	55,346	49,347	440,130	411,901
Kerosine	5,173	4,114	4,638	48,592	42,846
Gas oil and distillate fuels	10,715	8,732	10,010	113,747	96,324
Residual fuel oils	25,567	25,897	26,966	242,321	231,725
Lubricants	2,150	2,024	2,207	17,851	17,205
Wax	135	150	116	918	719
Coke	611	587	433	5,147	5,071
Asphalt	3,827	3,699	3,326	21,514	20,457
Road oil	1,128	1,553	1,072	6,697	6,986
Still gas	6,024	6,430	5,609	54,577	49,492
Miscellaneous	222	242	171	1,579	1,677
Losses	2,242	1,426	3,106	15,821	14,308
Total domestic demand	110,091	110,200	107,001	968,894	898,711
Daily average	3,670	3,555	3,567	3,536	3,292

*Compiled by Bureau of Mines. †Exclusive of 10,000 barrels exported from non-contiguous territories but inclusive of 740,000 barrels shipped from U. S. to territories.

Natural Gasoline, Sept. 1940*

(Thousands of gallons)

	Production				Stocks			
					Sept. 30, 1940		Aug. 31, 1940	
	Sept. 1940	Aug. 1940	Jan. Sept. 1940	Jan. Sept. 1939	At refineries	At plants and terminals	At refineries	At plants and terminals
East Coast	.....	.....	.....	.....	3,696	.....	5,754	.....
Appalachian	5,315	4,463	56,363	49,098	672	5,363	924	6,806
Ill., Mich., Ky.	3,182	2,759	22,118	9,917	6,132	649	7,560	486
Oklahoma	33,265	33,739	299,060	323,752	3,864	25,756	3,696	33,178
Kansas	4,768	4,788	46,360	43,855	84	2,143	42	2,024
Texas	82,619	79,107	663,751	556,506	12,138	110,924	15,834	122,601
Louisiana	9,304	9,723	79,927	66,877	210	1,351	336	1,381
Arkansas	2,977	3,125	24,427	19,108	714	335	714	233
Rocky Mountain	7,800	8,347	68,503	65,777	6,300	2,376	5,754	2,203
California	48,422	50,509	436,753	457,498	110,670	2,219	111,930	2,628
Total	197,652	196,560	1,697,262	1,592,388	144,480	151,116	152,544	170,940
Daily average	6,588	6,341	6,194	5,833	.....	.....	.....	.....
Total (thousands of barrels)	4,706	4,680	40,411	37,914	3,440	3,598	3,632	4,070
Daily average	157	151	147	139	.....	.....	.....	.....

*Compiled by Bureau of Mines.

Oil Burners*

	1940	
	Sept.	Aug.
New Orders, Less Cancellations	41,895	32,772
Unfilled Orders, End of Month	8,607	8,202
Shipments:		
Total	41,490	31,544
United States	41,243	31,197
Canada	189	199
Foreign	58	148
Stocks, End of Month	19,617	22,870

*Compiled by Bureau of Census.

Presides at A.P.I.C. Conference . . .

Harry T. Klein

● Presiding at the annual conference of the American Petroleum Industries Committee in Chicago this week, will be Col. Harry T. Klein, vice-president and general counsel of The Texas Co., who has been A.P.I.C. chairman since its organization in November, 1932. Last month, Col. Klein was elected executive vice-president of The Texas Co.

Born March 22, 1886 at Bellevue, Ky., Colonel Klein later received his L.L.B. degree from McDonald Institute, (Cincinnati Y.M.C.A. Night Law School), and practiced and taught law in Cincinnati.

In 1916, this lawyer-teacher attended Civilian Training Camp at Plattsburg and Officers Training Camp at Indianapolis. In 1917, he was commissioned a first lieutenant of infantry and served in France with the 28th Infantry, First Division. While in France, he was appointed first Major Judge Advocate and Chief Requisition Officer of the A.E.F. to administer the French Military Requisition Law.

Following the Armistice, Colonel Klein was appointed special counsel to U. S. Liquidation Commission, assisting in negotiations of settlement agreements with France and Italy, relating to occupational claims.

In 1921, he became associated with The Texas Co. as assistant to Judge Edwin B. Parker, general counsel, and in 1925 was appointed general counsel. In 1933, he became a vice-president of The Texas Co.

Colonel Klein has been on the board of directors of the American Petroleum Institute since 1933. He also serves on a number of pipeline committees, including the Steering Committee handling pipeline valuation proceedings with the Interstate Commerce Commission.

This oil man is a member of the American Bar Assn. and of the bars in Ohio, Kentucky and New York. Colonel Klein has received the D.S.M. (U.S.) and Chevalier and officer decorations of the French Legion of Honor, as well as the American Distinguished Service Medal.

NATIONAL PETROLEUM NEWS

VOLUME 32 WEDNESDAY, NOVEMBER 13, 1940 NUMBER 46

Higher Taxes For Defense Seen Likely

N. P. N. News Bureau

WASHINGTON, Nov. 8. — Treasury Department is likely to recommend higher federal taxes on gasoline and lubricating oil when Congress meets in January, but it is too early to say how much of an increase is in prospect. Treasury officials stated today.

Increased gasoline and lubricating oil levies would be part of a general rise in rates throughout the federal tax structure to meet national defense needs. Treasury plans do not contemplate singling out gasoline and lubricating oils for special additional taxes, officials said, adding that the only special levy now in sight is one on soft drinks.

Extent of the proposed increase in gasoline and lubricating oil tax rates probably will not be fully determined until the budget estimates are available in January and the Treasury is in a better position to estimate its revenue and borrowing needs for the defense program during the coming year, it was stated.

Leading Purchasers Hike Penna. Crudes

CLEVELAND, Nov. 12.—The decline in Pennsylvania grade crude prices which started in May and in 3-months time carried prices down 90c a bbl. ended today with announcements by 3 leading purchasers of a 15c per bbl. boost in their postings in fields where they purchase. Price for top-grade oil, Bradford-Allegany, is now back to $2.00 per bbl.

Higher prices were announced by Tide Water Associated Oil Co., Joseph Seep Purchasing Agency, and The Pennzoil Co., with National Transit Oil at $1.88 to $1.93, Southwestern Pennsylvania at $1.65, and Eureka (West Virginia) grade $1.59. Up to press time, no change in its postings had been announced by Valvoline Pipe Lines. This company had been posting $1.40 for southeastern Ohio, and same prices in other districts as other leading purchasers. Crude purchasers had no comment regarding the advances.

Some refiners said the advance came as a complete surprise, one adding that he had been anticipating "cheaper rather than higher" crude prices. Others cited the recent "high rate" of refinery crude runs, and said the advance was "no more than could have been expected."

Since the last reduction in prices (15c on Aug. 28), stocks of Pennsylvania grade crude as reported by U. S. Bureau of Mines have declined 25,000 bbls. to 4,656,000 bbls. on Nov. 2.

Pure Hikes Penn Crudes

CHICAGO, Nov. 12. — Pure Oil Co. today announced 15c increase to $1.59 per bbl. in price it will pay for Cabin Creek and Kelly Creek, W. Va. (Penna. grade) crudes.

Oil Defense Headlines Chicago API Meeting

By N.P.N. Staff Writer

CHICAGO, Nov. 11.—As part of its defense program, an immediate study is to be made by the oil industry of practical methods for safeguarding its gasoline storage facilities against sabotage and military attack.

The study is being undertaken by the American Petroleum Institute, it was announced at the start of the institute's annual convention in Chicago Nov. 11. Some plans have already been drawn and the work is to be furthered at a meeting Nov. 13 of oil company men with Dr. Robert E. Wilson, petroleum adviser to the National Defense Advisory Commission.

The ground work in the survey is to be done by engineers with the oil companies and is to be directed by a policy committee of heads of the large oil companies. It will be the task of the policy committee to see that the study is kept to practical, feasible methods and also to inquire into the methods proposed for financing whatever steps may finally be adopted for giving additional safeguarding to gasoline storage tanks.

U. S. Divided Into Districts

To facilitate the study, the country has been divided into 5 districts; Northeast, Southeast, Great Lakes, Central and West Coast. The needs of each district will be studied by a committee of engineers from oil companies operating storage facilities there. The chairman and sub-chairman of each district have already been selected. Other members will be selected at the meeting with Dr. Wilson and the personnel of the committees announced.

The policy committee of oil company heads has already been named. W. S. Farish, president, Standard Oil Co. of New Jersey, is chairman. Other members are: H. D. Collier, president, Standard Oil Co. of California; Henry M. Dawes, president, Pure Oil Co.; J. Frank Drake, president, Gulf Oil Corp.; George A. Hill, president, Houston Oil Co.; J. Howard Pew, president, Sun Oil Co.; W. S. S. Rodgers, president, The Texas Co.; W. G. Skelly, president, Skelly Oil Co.; J. C. Hunter, president, Mid-Continent Oil & Gas Assn.

The financing of whatever methods are adopted for giving additional safeguards to gasoline storage is being given much thought by executives of the oil companies with large properties involved. They point out that

Record A.P.I. Meeting Seen; 1000-Mile Lubrication Urged

By N.P.N. Staff Writer

CHICAGO, Nov. 12.—Registrations at the 21st annual meeting of the American Petroleum institute were heading toward a record today when the 2000 mark was passed about noon, which was well ahead of second-day registration last year. Attendance at the 1939 meeting totaled 3120. Record was set at Los Angeles meeting in 1935 when the count was 3144.

Defense topics, which studded the general program and the agenda of the group and committee meetings were credited with attracting the large attendance.

Dr. Robert E. Wilson, oil advisor to the National Defense Commission was on hand today. His address on Wednesday is expected to high-light general sessions of the A. P. I. meeting.

Dr. Wilson in his speech prepared for delivery at the A.P.I. meeting, predicted increased Army and Navy demands for gasoline and lubricating oils by Spring will offset losses sustained by the oil industry in foreign markets. Thereafter, total demand will increase steadily to a figure beyond any the industry has yet seen, he said.

Appraising the industry from

(Continued on page 15)

By N.P.N. Staff Writer

CHICAGO, Nov. 12.—Complete chassis lubrication of the nation's motor cars every 1000 miles, as well as a change of crankcase oil, will be recommended by the Lubrication Committee of the American Petroleum Institute, as a feature of its 1941 program. This was announced at meeting today of the Committee in Chicago, in connection with annual meeting of the Institute.

The Lubrication Committee has approved a booklet on complete lubrication of automobiles, which has been prepared by a technical sub-committee, and it will be sent out to oil companies shortly. Films, signs for station and educational material for stations, and consumers, is built around the sale of complete lubrication every 1000 miles.

"Lubricate For Safety . . . Every 1000 Miles," will be the slogan for 1941 program.

"The complete lubrication of chassis for all passenger automobiles at 1000 mile intervals is recommended without reservation by all motor car manufacturers and by the petroleum industry," states the new lubrication booklet, in introducing the reasons why motorists

(Continued on page 15)

the needs for protecting storage from attack, without or within the plant, as seen by the military authorities, may be greatly different from what the oil companies have found entirely sufficient for commercial operations. They feel that the cost of additional safeguards, if extreme, should be borne by the government.

Seek Storage Benefits

The oil men directing the institute's study believe that one benefit to come from its nation-wide study, may be the forestalling of unduly restrictive measures for protecting tanks, which might otherwise be adopted in legislation by municipalities having within their boundaries large amounts of gasoline storage. The oil companies hope to have the co-operation of all authorities, in waiting until the industry has made its own study and then in conforming to the steps the oil industry engineers find practical.

While the A.P.I. survey will include gasoline storage over the entire country, most attention will be given to refinery and marine terminal storage close to harbors along the Atlantic and Pacific Coasts. Some of the larger oil companies with large storage for gasoline at these locations have planned to store more gasoline at inland points, from which it can be moved conveniently to the coast.

This study by the A.P.I. is not the only one now being made on further safeguarding of gasoline storage. A committee of army engineers is now engaged on a similar study of existing government-owned storage plants. A special committee of oil company engineers under Oil Defense Advisor Wilson is already studying methods of installing new storage tanks for the government, particularly for aviation gasoline.

While the study of safeguarding existing oil company storage ties in closely with the program of the military authorities, to see that gasoline storage at all strategic points is adequate and also properly protected, the oil companies feel that protection against sabotage is a matter they will largely have to work out within their own organizations. They are already adopting the same means to this end as are being used by other plants whose operations are important to the national defense program.

Boyd Says API Aiding Defense In Study of Gasoline Storage

W. R. Boyd, Jr., executive vice president of the A.P.I., made the following statement on the study of the need for further protection of gasoline storage:

"The American Petroleum Institute is making an initial contribution to national defense preparations by accepting the invitation of the National Defense Commission to survey the nation's gasoline storage facilities and to study means, and methods for safeguarding stocks of motor fuel and other petroleum products against military attack and sabotage. A committee organization representative of the petroleum industry will be created for this work. Regional engineering committees will proceed immediately with the task.

"Technological progress of the petroleum industry has put the American nation in the fortunate position of having refining and storage facilities adequate for both military and civilian needs. American petroleum refiners have led the world in developing aviation fuels so necessary to modern warfare, and the nation now has the world's greatest refining capacity and storage facilities.

"The details of the survey and its objectives already are receiving the full attention of the industry's engineering talent. Appointment of national, regional and other committees in the near future should see the work rapidly get under way. In order that no time may be lost, preliminary discussions will take place during the Institute's annual meeting in Chicago."

Defense Is Main Topic

Principal topic of speakers at the general sessions of the A.P.I. convention will have to do with the oil industry's part in the national defense program. Mr. T. H. Barton, president, Lion Oil Refining Co., El Dorado, Ark., will speak on a defense subject, as will H. W. Prentis, Jr., of the National Assn. of Manufacturers. Mr. Prentis speaks at the general session, Nov. 14.

The A.P.I. Department of Statistics made public, at the start of their convention, data to show the extent to which the refiners of the country are increasing their output of aviation gasoline.

Output of aviation gasoline of all grades is now at the rate of nearly 550,000,000 gals. a year, more than double the rate of a year ago, said Fred Van Covern, director of the statistics department. Reports indicate that plant capacity to produce these fuels is still being increased, he stated.

Production now is greatly in excess of normal needs, he said. Total domestic consumption in 1939 was placed at 125,000,000 gals., according to Mr. Van Covern.

Production of 100 octane number gasoline in 1939 was about 100,000,000 gals., he said, as compared with output of 7,000,000 gals. in 1937, the first year of large-scale production. Present stocks of aviation fuel of all grades are the largest in the history of the country, and for the past 3 months have been growing at the rate of 9,000,000 to 12,000,000 gals. a month. Oct. 31, these stocks were close to 240,000,000 gals., more than twice the total at the same date the year previous.

All indications, Nov. 11 were for a large attendance at the institute convention, which lasts through Nov. 15. Official registration the first day was 1204, as compared with 1181 on the first day a year ago.

New 'Heavy Duty' Motor Oils Endorsed by Research Group

Special to N.P.N.

CHICAGO, Nov. 11.—Admitting that heavy-duty service conditions are becoming more common in the operation of gasoline and diesel engines, prominent research men in the automotive industry are hearty in their endorsement of the new 'Heavy-Duty" motor oils now being manufactured by some oil companies.

With improvements in engines, fuels and roads, it is recognized that service requirements on these engines have increased rapidly and have placed new burdens on the protective properties of lubricating oils.

Although it is expected greatest demand for the heavy-duty oils will come from truck and bus operation, it is indicated that passenger cars in some types of operation will require the new oils, and that many passenger cars will give better performance and longer life if these oils are used.

Wider Use Seen

To date, most of the so-called heavy-duty motor oils manufactured have been used primarily in commercial vehicles to overcome lubrication troubles resulting from adverse driving conditions. A far wider use, however, in which these oils will be handled and distributed by oil marketing companies generally, is foreseen by their proponements.

Some of the characteristics of these oils and an idea of what is expected of them, can be obtained from a paper presented by H. C. Mougey, Technical Director, Research Laboratories Division, General Motors Corp., before the annual meeting of the American Petroleum Institute, Chicago, Nov. 11-15. The author outlined the ideal lubricating oil as one made from a suitable type of crude and so refined that:

1. It would not form undesirable deposits when subjected to heat in the combustion chamber.
2. It would not contain objectionable amounts of easily-oxidized sludge-forming materials.
3. It would not corrode bearings nor oxidize in the crankcase, forming corrosive acids or objectionable amounts of insoluble oxidation products.
4. It would have the property of preventing any soot or carbon or other decomposition products from sticking to the surfaces of the engine parts. This property is called "detergency".

The author of this paper states that "for moderate duty, oils of a wide variety of properties appear to be satisfactory; but for higher duty, which means operation at higher temperatures, oils which are resistant to the effects of higher temperatures are very desirable, even though oils of quite poor quality may be operated under severe operating conditions if they are drained frequently enough." This paper will be published in full in the Nov. 20 issue of NPN.

More A. P. I. Information On Pages 29, 32

In addition to last-minute reports in this week's news section, about the A.P.I. convention in Chicago, two papers read at this meeting are discussed on pages 29 and 32 of this issue of NPN.

Proper maintenance and mileage is discussed in one story and engine performance as influenced by ignition-timing maintenance is discussed in another story.

Oil Burner Shipments Rise in September

N. P. N. News Bureau

WASHINGTON, Nov. 7.—Shipments of oil burners totaled 41,490 in September as compared with 31,544 in August; 35,352 in Sept. 1939 and 26,405 in Sept. 1938, Census Bureau reports. Figures covered 170 manufacturers in 1940 and 178 manufacturers in 1939 and 1938.

1000-Mile Lubrication Urged In Institute's 1941 Program

(*Continued from page* 13)

should have their cars completely lubricated every 1000 miles. "However this recommendation is not followed today by more than 50% of the driving public.

"The Lubrication Committee believes that the driving public can be convinced of the importance of 1000 mile chassis lubrication in the light of personal safety to the motorist and in the safety to his investment."

Safety Points Cited

Important safety points in the operation of a car which are protected by proper chassis lubrication are presented in the booklet. Lack of proper chassis lubrication, the committee states, may cause the following:

Freezing up of shackles, exerting extreme load on springs, which may cause spring leaves to break.

Extreme wear of steering assembly bearings, wheel bearings and tie rods, necessitating early replacement and causing dangerous wheel shimmy, misalignment and undue tire wear.

Lack of proper lubrication of distributor, starter and fan, may throw ignition system off, causing hard starting at possibly critical moments.

Lack of lubrication of water pump may cause pump failure and further motor damage while driving at high speeds.

Lack of rear wheel lubrication may lead to dangerous axle failure.

Lack of brake cable lubrication may cause brakes to become locked in either on or off position.

Lack of shock absorber lubrication and inspection leads to driver fatigue which may become a hazard in driving.

Lack of universal joint lubrication may cause excessive wear on transmission and differential gears and lead to a broken drive shaft.

1000-Mile Change Arguments

The Lubrication Committee presented an additional argument for 1000-mile change of crankcase oil, in its new booklet, by pointing out that the motorist who drives even 1000 miles before changing his oil, may be using oil that has been exposed to the heat, acid and dirt within his motor for many more miles than his speedometer shows.

Motorists fail to realize, the committee states, that their motor operates many more miles than the speedometer indicates. The idling time spent waiting for traffic lights, warming up before starting, or stopping to make a left turn, or parking with the motor running keeps the motor turning over even though the car is not moving. Tests recently made, says the committee, show that while a car has traveled 1000 miles along the road (road miles) the miles traveled by the motor (motor miles) may be 1500 or even 2000 under certain driving conditions.

The Lubrication Committee considered at its meeting here a tentative list of products required at service stations for proper lubrication of cars, which was agreed upon at a meeting of representatives of the automobile and petroleum industries in Detroit, Sept. 12.

The list included 15 required products and 5 extra or optional products, W. H. Correa, New York, of Socony-Vacuum Oil Co., and Lubrication Committee chairman reported, as compared with a list of 71 products specified by the car makers as required for the proper lubrication of all their models (See NPN Sept. 25, 1940, page 14 for tentative list).

List is to be submitted to oil companies for their comment and is to be gone over by the technical subcommittee of the Lubrication Committee early in December, preparatory to meeting again with representatives of the automobile manufacturers on this subject.

Reduce Number of Lubes

Members of the Lubrication Committee commented on the need for the oil companies and automobile manufacturers to reduce as much as possible the number of lubricants required in lubrication of cars, in view of the present efforts of the War Department to reduce the number of lubricants required for lubrication of motor vehicles in Army use.

They said Army officials wanted to reduce to 4 the number of lubricants required for servicing cars in combat zones.

Record A.P.I. Meeting Seen; Hear Dr. Wilson on Defense

(*Continued from page* 13)

a national defense viewpoint, Dr. Wilson urged no relaxation in normal activity toward making new discoveries. New wells and fields must be discovered and connected up and new pipe lines built as old fields play out, he stated.

Hold Old Equipment

Old refining equipment should, so far as possible, be held in reserve for emergencies, as new and more efficient equipment is developed and installed.

While hesitating to recommend an expansion until the government is ready to make more substantial high-octane aviation gasoline purchases, Dr. Wilson urged all existing synthetic capacity be operated and no more synthetic product be diverted to motor fuel.

Government storage of 91-octane aviation gasoline is not so urgent as in the case of the 100-octane but nevertheless should be undertaken, Dr. Wilson said, as he expressed the hope the industry will conserve all available supplies of 91-octane.

Lubricating oil requirements of the aviation and Army mechanization programs will be very substantial, Dr. Wilson stated, adding that efforts are under way to reduce the number of different lubricant specifications so as to simplify the problem of supplying the needs of the Army in particular.

Reserves of heavy fuel oil for the Navy are adequate on the West Coast, Dr. Wilson said. Defense Commission Oil Section, which he heads, however, has recommended building of additional reserves of fuel oil on the East Coast and at proposed new naval bases.

Transportation of heavy fuel oil by pipeline is, of course, not feasible and the building of additional crude lines to eastern refineries probably could not be justified as an investment for private capital, although having defense value, Dr. Wilson said. Further development of gasoline pipeline and inland-waterway transportation, at least to the extent that it could be financed by private capital would be desirable, however, he said.

Referring to the A.P.I.'s appointment of regional committees to survey problem of defense protection for oil storage, Dr. Wilson said underground storage of much of the industry's stocks would not seem to be either feasible or necessary, but where new tankage is to be built in congested areas with high land values the saving in area required, plus the greater safety and lower upkeep, should be carefully considered as offsets to the higher costs of buried storage.

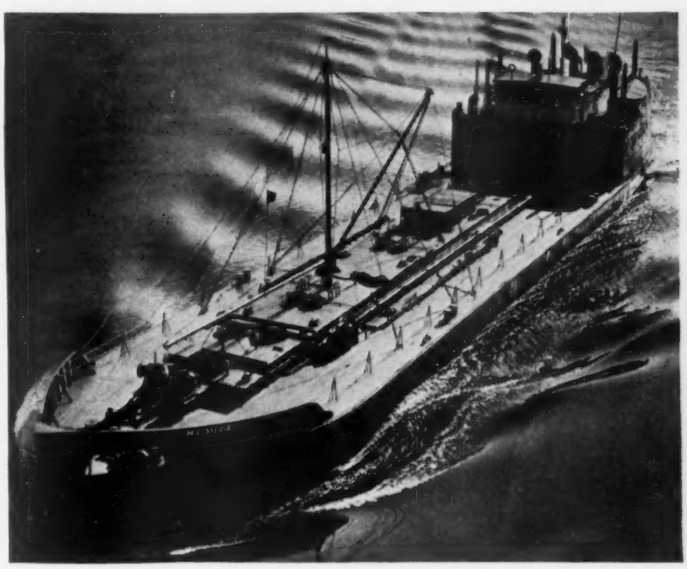
Hear A.P.I.C. Head

A. P. I. Board of Directors meets later this afternoon. Among other reports, it will hear from Baird H. Markham, director of American Petroleum Industries Committee, on A. P. I. C. activities for past year.

General Markham will report that action to dedicate gasoline taxes and registration fees to road improvement purposes exclusively has been sweeping the country for the past 5 years.

"Just as the gasoline tax, after being originated in Oregon in 1919," said General Markham's report, "was adopted by state after state to provide funds for needed highway

A.P.I.'s First Photo Salon Award



"Oil Tanker", a photograph by Hiland Dale Holt, West Hartford, Conn., won first prize in the A.P.I.'s Photographic Salon's contest. This photo with many others are on display this week at the A.P.I. meeting at Chicago's Stevens Hotel

improvements, so constitutional amendments, are now being adopted by an ever increasing number of states to insure that the intent of the special highway taxes is carried out and the money is actually used for the administration's maintenance and improvement of the state highway systems."

General Markham cited the victories for anti-diversion amendments in the recent election as evidence of this trend (see page 25 of this issue.)

While greater uniformity of vehicle-weights is desirable, such regulation should avoid the imposition on all areas of any requirement calculated to meet a condition in only one area, according to a paper by J. W. Sinclair, Los Angeles, of Union Oil Co., at automotive group sessions. Regional uniformity should be the objective.

Three things lie among tasks that must be done by those who would remove state barriers to the free movement of interstate commerce, Mr. Sinclair stated:

"Adopt uniform vehicle size and weight standards, thus removing restrictive bottlenecks such as the Kentucky low size and weights limits.

"Abolish ports-of-entry and other highway barriers.

"Extend reciprocity among states and prevent the repeal of reciprocal laws."

Extinguishers Revolutionary

An automatic fire extinguisher built into tank trucks, which may prove as revolutionary in the field of automotive transportation as was the automatic sprinkler when first used to safeguard commercial buildings, was also explained by J. F. Winchester, New York, of Standard Oil Company of New Jersey in his paper "Preventing Tank Truck Fires." This safety device, he said, is still in an experimental stage, but if it proves as successful as is now indicated, it will be a boon to the industry.

Mental characteristics are as important as physical characteristics in the selection of good truck drivers, R. B. Roaper, of the Humble Oil and Refining Co., told the meeting. A driver may satisfy all the necessary physical requirements, he said, and still be undesirable for the job because of improper weight, nervousness, or other body or mental diseases.

Seldom do tested safety measures fail to work, Mr. J. M. Pearson, of the Sun Oil Company reported. When they fail, either the remedy has been misapplied or other factors not accounted for have been present. Even lightning striking gasoline tanks is substantially harmless if the tanks are of modern all-steel construction and gas tight, he said.

All Cole Committee Members Returned in Nov. 5 Election

N. P. N. News Bureau

WASHINGTON, Nov. 8. — Chairman Cole and all members of the congressional oil investigating subcommittee were returned to Congress for another two years in the Nov. 5 election.

Members of the subcommittee are Congressman Edward A. Kelly, Ill.; Herron Pearson, Tenn.; Charles A. Wolverton, N. J.; and Pehr G. Holmes, Mass.

Congressman Cole has not yet returned to Washington, and has not yet made any comment on whether he will file his long-awaited oil report before this session of Congress.

In Kansas, Governor Payne Ratner, advocate of increased markets for Kansas crude and leader of opposition against federal control, apparently has lost his fight for re-election. In a recount that is yet incomplete, it was conceded that Democratic nominee Burke had won the Kansas governorship.

Culberson on Commission

The "Democratic" state of Texas re-elected Governor W. Lee O'Daniel for another term and placed Olin Culberson on the Railroad Commission bench. Mr. Culberson, who had an important part in curbing "hot oil" activities during East Texas' "heydey," will replace Lon Smith, who retired from public office. Mr. Culberson worked under Railroad Commissioner Thompson in East Texas and it is believed, in most circles, the 2 would form a coalition or majority on the commission.

Oklahoma voters chalked up a comfortable majority for W. J. Armstrong for post on the Oklahoma Corporation Commission. Mr. Armstrong is Oklahoma's pioneer conservation director for the commission and last Tuesday's election places him on the Commission that administers Oklahoma's oil and gas proration laws.

Outcome of Louisiana's vote on constitutional amendments providing for a $3 auto license tax and prohibiting any municipality or parish from levying tax on gasoline or motor fuel still was uncertain. Louisiana voted on 28 amendments and precinct--parish returns were slow coming in. Absentee vote was causing further delays.

Apparent defeat of the income tax amendment, however, is expected to bring from Governor Sam Jones of Louisiana a call for special session of the legislature to initiate new revenue-raising laws. Sales tax probably will be the paramount revenue-raiser, although secondary consideration may be given a tax on natural resources.

Harrington Re-elected

Albert F. Swanson, republican, vigorous proponent of alky-gas was defeated by incumbent Congressman Harrington for the congressional seat of the ninth Iowa district (Sioux City). Harrington, author of the petroleum marketing divorcement bill and author in previous Congress of a bill favoring blending of farm alcohol with gasoline, in his campaign hit the efforts 2 years ago of proponent of alky-gas in Sioux City. He pointed out in his addresses that station operators of Sioux City and vicinity suffered a net loss of approximately $60,000 in the "great black strap molasses hoax." He said that station suffered a loss of 17c on each gallon of blending fuel he handled.

In addition to victories in 3 states of Constitutional Amendments to prevent the diversion of gasoline taxes, (see page 25 of this issue) 2 bond refunding measures in Arkansas were defeated. One of them provided for issuance of general refunding bonds, fixed maximum amounts and would have withheld the release of motor fuel tax funds until bonds were paid.

An initiative petition in Arizona, which would have allocated highway funds to municipalities, was defeated.

Freezing Weather Seen By Old Man Winter

CLEVELAND, Nov. 12. — Freezing weather within the next week was predicted here today, for the Mid-West, indicating that Old Man Winter is about to give oil marketers the final cue to start selling winter change-overs to all motorists in the freezing and below freezing parts of this country.

"Considerably below normal" was the prediction made by the weather man, who said that "normal" for most parts of the Middle West, during the past week, had been between 39 and 42 degrees.

Aviation 'Gas' Buying Program Changed New Plan Sent to Defense Oil Advisor

N. P. N. News Bureau

WASHINGTON, Nov. 12.— New Army-Navy 100-octane aviation gasoline buying program which contemplates purchase of some 3,000,000 bbls. in the next 14 months, today was referred to Dr. R. E. Wilson, Defense Commission Oil Advisor, for comment.

From Dr. Wilson, plan will go to the secretaries of War and Navy for final approval. New program supplants original plan to buy 7,500,000 bbls. of 100-octane gasoline over a two-year period, and bears the favorable recommendations of the joint Army-Navy Aeronautical Board, as well as the approval of the Army and Navy Air Corps.

Direct Purchases

As it now stands, gasoline buying program provides for direct purchase by the Army and Navy instead of through an RFC corporation as was first proposed. Although the idea of renting storage at refineries has been dropped, in some cases refiners may be asked to store aviation gasoline purchased for a month or two until government storage facilities are completed. Some of the government tanks are now ready; others are still in the construction stage.

Principal Changes Told

Representing a modification of the original program, new aviation gasoline buying plans call for a 100-day reserve, based on the number of Army and Navy planes in operation on any date between now and Dec. 31, 1941.

Thus, amount of gasoline in storage will increase directly in proportion to the number of Army and Navy planes in actual operation, exclusive of those held in reserve. Principal change in the buying program has been the adjustment of gasoline purchases to coincide with the expansion of the Army Air Corps under its new four-air-fleet reorganization.

Buying program does not contemplate any stimulation of new 100-octane aviation production until after 1941, Army and Navy air corps contending present plant capacity is adequate for their needs during the coming 14 months. Beyond that time, however, it is possible 100-octane production facilities may have to be enlarged to meet the growing demands of the military air forces.

THE EDITOR'S PAGE

Readers Comments and Opinions will be much Appreciated by—WARREN C. PLATT, Editor and Publisher, Penton Building, Cleveland, O.

Oil Still in the New Deal Dog-House

The national election seems to leave the oil industry about where it was, politically and legislatively,—

—confronted with a decidedly antagonistic federal administration,

—faced with federal court suits, the last one calling for broad and sweeping fundamental changes in the set-up of 80% of the oil industry, and

—with the Roosevelt-Ickes oil control bill, to take all power for "conservation" away from the states and place such power, along with power to declare "wasteful use" and "handling" etc., in a single individual at Washington—with this bill still pending in Congress.

If anything, the oil industry may be said to be in a worse position politically because so many of the New Deal are calling the election a "mandate" for continuance of New Deal "aims and objectives." These followers of Roosevelt, and others, are asking for "unity" and "co-operation" of an order that would leave no room for the oil industry to even criticize, let alone oppose, these New Deal plans to take it over, except on peril of being called "unpatriotic" and perhaps even "traitors."

Criticism certainly is not considered "patriotic" by the New Dealers. Ickes has issued a diatribe to the press of the country that it should shut-up and be "free" and "impartial like the radio." He did not mention that the radio is under license by the federal government to which it must go every six months to get its life renewed. Roosevelt, after the election, promptly called in one of the leading columnists and criticized him for his comments on the New Deal and then had him barred from further White House press conferences. When this became public the order was countermanded, or rather it was declared to be "a mistake."

So all together whoever bucks the "mandate" of the New Deal is undoubtedly in for plenty of revilement and questioning of his "patriotism."

But whether it is "patriotic" in the view of the New Dealers or not, we still believe that oil men are American citizens, entitled to the same rights and privileges as if they had all voted for Roosevelt for a third term, and that they are still justified in protecting their own property and in insisting on their own free and lawful use of it.

It is hardly to be expected that after this "mandate," Roosevelt and Ickes will give up their attempt to control the oil industry from Washington under the guise of "conservation." Undoubtedly the administration will push the present bill, and if necessary, have it renewed in the next Congress. Or, what is also quite probable, the New Deal will declare a 68th "emergency" and by presidential proclamation for "defense purposes" achieve the same end.

Whenever that attack may come, we hope that every oil man will pitch in and fight for his property and his business freedom regardless of any cries of the New Dealers as to a "mandate." Roosevelt refused to enter into any discussion during the campaign of the great issue raised by his administration: that of centralizing power at Washington as against leaving it in the states or even locally.

Willkie did discuss that point, and it may be fairly said that the 22,000,000 or more people who voted for him were registering their approval of his opposition to the New Deal's conception of centralized government. As less than a half million voters, it has been pointed out, in key states turned the election to Roosevelt, these 22,000,000 anti-New Deal voters should hardly be dragooned, by the less than a half million, to accept without protest, a revolutionary change in the status of their business and of their property.

We Need a National Oil Marketers Forum

Many times in past years, NPN has remarked on the great need of the oil marketing part of the oil industry having some over-all organization or forum where it could discuss its problems and through which it could express opinions. Had there been such an organization, truly representative of all legitimate interests in oil marketing, we would hazard the guess that the course of events these last seven years might have been entirely different.

The need for such a national marketing organization is all the more apparent the further this country enters "war defense" and especially in view of the outcome of the last national election. There is the need for all in oil marketing having a clearer idea of oil conservation and what it really is and being in a position to protect themselves against any phony "conservation" legislation such as is proposed by the New Deal. Also, we now have the consumer's division of the National Defense Commission this week holding public hearings on the position of wholesalers in the scheme of things war-like. As this country approaches war or war-defense, not only prices but the machinery of distribution is going to come in for much overhauling and, if the past is any criterion, much criticism and inane suggestions for reforming it. Oil marketing will hardly escape such attention.

Oil marketing should be nationally represented not just on a basis of capital invested, but on the basis of all the "management" that operates oil marketing.

It is undoubtedly useless to look to the American Petroleum Institute, itself under charges of conspiracy, to organize its old marketing division so as properly to afford a forum to all in oil marketing. It is dangerous these days for the vice-president in charge of marketing for one major oil company to even admit that he knows the man holding a similar job with another major company.

What the oil marketing division of the industry has, however, is a score of state associations that have grown up over the years, that have weathered many an internal political storm as well as financial difficulties. They are not all as strong as they should be and they do not all represent marketing in their respective states as well as they might. But at all events here they are, alive and steadily growing and representative in the main of a large part of the legitimate and independent marketing interests of the country, both those marketers selling nationally advertised brands and those selling under their own or local brands.

The presidents of these state associations could form the nucleus of a national organization through which they could not only look out for oil marketing on a national basis, but through which also they should be able to lend much needed help to strengthening the present state associations and even organizing others.

We do not mean that there must be an elaborate and expensive national headquarters, desirable as a good national office might be. At least, the presidents of these state associations can act as a supervising council for oil marketing, meet with reasonable frequency and be a means at least for assembling the points of view of all marketers as well as be a watch tower against encroaching dangers.

The more modest the start, the better chance, probably, the plan has of living and growing. The great asset of these state associations is that they have just grown despite all their tribulations from great diversity of opinion and shortage of money. If the idea of state associations was not sound and practical these state oil marketer organizations never could have survived their troubles.

It should be possible to put together a truly national organization on the same modest basis. If the idea is sound, the idea will live,—and we think it will live.

Making the Democracy of Private Ownership Work

"The thing known in privately-owned business as profit—is the margin that enables consumer co-operation to pay for factories of their own.

"Because profit is an over-charge that is taken in addition to the cost of a product after all other charges have been met.

"Cooperatives recognize it as an over-charge and use it to capitalize new industries, or enlarge present facilities and services, or return it to members in proportion to their purchases."

The above is the definition of business co-operatives given by Howard A. Cow-

den, president of the Consumers Cooperative Association, North Kansas City, Mo., organizer and operator of a big oil marketing establishment, compounding plant and now a refinery, pipe line and producing business. This definition was given by him at a meeting of the Cooperative League of the U. S. at Chicago last month.

The above, we submit, is also a good definition of a so-called private capitalized business as against which co-operative promotors have so often inveighed. In practically all co-operatives, we believe, the "members" in one way or another are in effect "stockholders," but they get their "dividends" at time of purchase or seemingly on their purchases instead of on their investment.

Co-operatives in oil got their big start in past years when jobbing and retail margins were wide and gasoline consumption was increasing so rapidly that the rate of increase possible to a marketer, at a lower price would greatly offset that lower return per gallon. Thousands of regular oil marketers also grew at the same time and for the same reasons. That is where the ten thousand oil marketers of the country came in against the old Standards and that is where most of the present 22 "major" oil companies came in also, and grew and grew until they became "majors," big enough to be joined in "anti-trust" law suits with their erstwhile "monopolistic" competitor.

But where the "co-ops" have put it all over their major competitors, and we believe this is true in other lines than oil, is that they have instilled in their "members" or "stockholders" a vital active fighting sense of "ownership" of the enterprise. A "co-op" member feels that he is an "owner" of his oil business, that he has something to say about its management, that it is up to him to see that it grows and that the local manager carries on his job right.

This feeling undoubtedly comes about, not only through the crusading spirit with which the co-op enterprises are organized, but chiefly because the co-op requires its "members" to sit in every month and help "manage" the local business. If anything is handed down from "on high," from general headquarters in the co-op business, it is done so tactfully that the local "members" or "stockholders" do not see it that way. They think of the "management" as originating with them because they meet often and pass on the affairs of the local business.

The average American corporation where the common stockholder has full voting rights, is as truly democratic in its structure these days as is the "co-op" plan. These corporations, with few exceptions are now owned nationally by ters and hundreds of thousands of people. The one time organizers and chief stockholders have been washed out by death and time and the natural changes in business. But the public still thinks of these big companies as dominated by a single far away group. Their stockholders, we believe, have an equally detached attitude because they do not feel a vital sense of actual ownership in the business right down to that part located in the stockholder's home town.

Various reformers talk about "socializing" business. We wonder how much more big business in the main today could be "socialized" in its ownership, short of its common stock being held in the U. S. Treasury Department, than when it is owned, as today, by millions of people all over the country?

When these reformers, legislators and so-called politicians start kicking a big corporation around, it is our observation that holders of stock, at least in other big companies, join blithefully in the kicking. In fact you never hear of the stockholders of the company that is being kicked stepping out and defending it.

But try kicking a co-op around, small or large, it doesn't make any difference. You not only have its own "stockholders" or "members" on your back but you have the "owners" of all the other co-ops in the country after you.

Why?

Isn't it because the co-op owners have a more active sense of ownership of the business than have their brother stockholders in the so-called "private" companies?

There certainly must be stockholders of these "private" companies among the "owners" of the co-ops. Did anyone ever hear of a co-op "stockholder" stepping forth to do battle for his "private" stockholdings?

Major oil companies, and other large corporations of the country, might well take a leaf out of the "co-op" book and teach their stockholders to be active stockholders, by first giving them an opportunity, perhaps in group meetings, to pass on the acts of the company and thus make them actively conscious of their ownership of the business down to the bulk plant and service stations in their home town.

Is there any more "democratic" structure in the world than that of the common stock ownership of a big company, and yet where is that "democracy" at work for the company?

In the case of the oil companies every stockholder is a consumer, just as much as if he were a "member" in a "co-op" oil company. There is actually no difference in the set-up between the two types, except that the "co-ops" make their "democracy" work and the major oil companies do not.

Is not one solution to the bitter feeling against large companies, oil and others, in this country, to make the millions of common stockholders into active owners of their businesses?

Lecturing them and making occasional reports, via little slips of paper with a dividend check, is not enough. The true democracy of common stock ownership must be made to work, just as the oil "co-ops" have so successfully made it work all these years.

Despite all the opposition and natural difficulties of management, the "co-op" idea has survived, and as it still grows, it is only fair to assume that there must be something inherently good and sound in it, and we wonder if that fundamental good idea is not in making the "democracy" of private ownership actually work, rather than in the "savings" or "dividends" that have been paid to their "members" or "stockholders?"

One of the ways, perhaps, to save this country from a "Fourth Term Candidate" in 1944 might be to put stockholders to work at being owners of "big business" and of all business?

Thanks, Mr. Cowden, for the text, whether you agree with all our comment or not. Like the "co-ops" themselves, perhaps your speech may serve to present a more intelligent conception of the "private ownership" of American business in which all of us have our dollars.

New Tow Boat to Operate On Mississippi and Ohio Rivers

CHICAGO, Nov. 10.—In line with increased water transportation of petroleum products, "Stanolind A", a new towboat, was recently commissioned by Standard Oil Co. of Indiana for towing barges on the Ohio and Mississippi rivers. On Nov. 4 this new towboat glided up the Ohio and tied up at her home port, Evansville, Ind.

To Haul on Mississippi

Petroleum products, mostly gasoline, will be transported from the Wood River refinery of Standard Oil to storage depots at Evansville, Ind. and Winona, Minn., company officials told NATIONAL PETROLEUM NEWS. Two other main stop-over points will be Cape Girardeau, Missouri and Bettendorf, Iowa—the industrial suburb of Davenport, Iowa.

The "Stanolind A" is 144 feet long over all, 35 feet in the beam. Its depth is 8½ feet. Power is furnished by two 600 h. p. diesel engines.

Although designed exclusively for river towing, the "Stanolind A" was built on Lake Michigan by the Manitowoc Shipbuilding Co. of Manitowoc, Wis. On completion, it came under her own power down the Lake to Chicago—through the drainage canal to the Illinois river—then down the Mississippi to the Ohio, and up the Ohio river to Evansville, its home port.

Dubbs double edge

The first refiner to install Dubbscracking in his territory gets the edge on his competitors in marketing as well as in manufacturing

Dubbscracked gasoline sets quality standards that motorists go for—that ordinary gasoline can't meet—there's the marketing advantage

And the refiner makes his Dubbscracked gasoline from any kind of oil—and at lowest cost—that's the manufacturing advantage

How can his competitors get even?

Why, by installing Dubbscracking too—and U. O. P. catalytic polymerization to make high octane polymer gasoline from the cracked gas

No wonder more and more refiners are installing both processes

Universal Oil Products Co
Chicago, Illinois

Dubbs Cracking Process
Owner and Licensor

California Natural Group Holds Annual Fall Meeting

N. P. N. News Bureau

LOS ANGELES, Nov. 8. — Technical contributions made by members of the California Natural Gasoline Assn., was among many topics discussed at the association's annual fall meeting here this past week, which saw the largest attendance to date.

"Commercial Butane, a Waste Material, Becomes a Valuable Product", was title of a paper read by C. E. McCartney, Petrolane, Ltd. D. D. Purrington, Standard Oil Co. of California, led a discussion on this subject.

The morning session was opened by W. C. Dayhuff, Standard Oil Co. of California, vice-president of C. N. G. A. who turned the meeting over to T. L. Taggart, Standard Oil Co. of California, chairman for the morning. First event on the program, L. V. Cassaday, Lomita Gasoline Co., president of C.N.G.A. presented a brief review of C.N.G.A.'s growth, development and progress from the time of its organization up to the present in which he stressed the many contributions made by the group's technical committee to the industry.

When secretary meets secretary: At left is George L. Tyler, secretary of California Natural Gasoline Assn., and William F. Lowe, secretary of Natural Gasoline Assn. of America. Meeting was held in Los Angeles. White spots are not powder but California sunshine

Standardization Stressed

Mr. M. W. Kibre, General Petroleum Corp., chairman of the C.N.G.A. technical committee, presented a report of that group's activities during the last year. In his report, Kibre stressed that in all work, standardization was the keynote. In connection with Kibre's remarks, D. A. Smith, Tide Water Associated Oil Co., presented a report on the new C.N.G.A. bulletin titled "Physical Constants of the Components of Natural Gas and Gasoline;" Francis Laird, The Texas Co., reported on the bulletin "Low Temperature Fractional Analysis of Natural Gas and Gasoline;" and C. B. Heartwell, Standard Oil Co. of California, reported on the bulletin "The Chartman's Manual."

The morning session closed with the presentation of the first of the day's papers "Application of Mass Spectrometry to Analyses of Hydrocarbon Gas Mixtures," by Harold W. Washburn, United Geophysical Co., with Messrs. F. N. Laird, The Texas Company, and Ed. Shaefer, engineer, leading the discussion.

A feature of the noon period was a luncheon tendered by the association honoring its directors, standing committee chairmen and the speakers of the day as well as the honored guests in attendance.

O. C. Field, O. C. Field Gasoline Corp., chairman of the afternoon session introduced Henry N. Wade, Parkhill-Wade, who presented a paper titled "Distillate Recovery Systems." W. H. Geis, Union Oil Co. of California and Dr. W. N. Lacey, California Institute of Technology, led the floor discussion.

S. H. McAllister, Shell Development Co., presented "Processes for the Conversion of Light Hydrocarbons to High Anti-Knock Aviation Fuels" in which Gale Adams, General Petroleum Corp., and Charles A. Day, Jr., Richfield Oil Corp., were discussion leaders.

The evening session was given over to relaxation and featured the association's 15th Annual Banquet which was followed by a series of vaudeville acts.

In charge of the event was the association's Fall Meeting Committee which consisted of J. B. Taylor, Signal Oil and Gas Co., chairman, H. L. Eggleston, Gilmore Oil Co., Harry Fiske, Ingersoll-Rand Co., C. D. Gard, Union Oil Co. of Calif., M. W. Kibre, General Petroleum Corp., John H. Kunkel, Public Relations Counsel, H. E. Leedy, Crane Co., W. W. Robinson, Jr., The Texas Co., and George L. Tyler, Secretary of C.N.G.A.

Among those present were William F. Lowe, secretary, N.G.A.A., and C. R. Williams, Continental Oil Co., chairman of the N.G.A.A. technical committee, returning the visit of a C.N.G.A. contingent which attended the Natural Gasoline Assn. of America's 19th Annual Meeting held in Tulsa in May of this year.

C.N.G.A. Members at Los Angeles

Among those attending the California Natural Gasoline meeting at Los Angeles were, from left to right: Harry Fiske, Ingersoll-Rand Co.; H. E. Leedy, Crane Co.; W. W. Robinson, Jr., The Texas Co.; L. V. Cassaday, Lomita Gasoline Co.; George L. Tyler, C. N. G. A. secretary; John H. Kunkel, C. N. G. A. public relations counsel; C. D. Gard, Union Oil Co.; M. W. Kibre, General Petroleum Corp.; J. B. Taylor, Signal Oil & Gas Co.; and W. C. Dayhuff, Standard Oil Co. of California

Oil Not Scheduled For Defense Talks

N. P. N. News Bureau

WASHINGTON, Nov. 12. — Oil is not among ten wholesale lines listed for discussion in the program of the conference on wholesale distribution of consumer goods called by Miss Harriet Elliott, Defense Consumer Commissioner, which met here today in closed session.

Topics for discussion have been selected on a basis of the size of the industry and possible development of price and distribution problems Miss Elliott's office explained, saying oil could be brought up during the meeting.

Conference program schedules distribution bottlenecks, and discussions of problems of wholesale grocery, produce, hardware, cold storage, and merchandise warehousing. Price discussions are scheduled on wholesale meat, dry goods, tires and rubber goods, and drugs.

Two oil groups, National Oil Marketers Assn. and Independent Petroleum Marketers of Oklahoma, have been invited—on the basis of lists of national wholesalers associations furnished by the Commerce Department and U. S. Chamber of Commerce, Miss Elliott's office said—but neither has indicated, so far, it would have representatives present.

Mid-Continent Group Elects Officers for 1941

TULSA, Nov. 11.—Officers of the Louisiana-Arkansas division of the Mid-Continent Oil & Gas Assn., for 1941, are as follows:

Charlton H. Lyons, Shreveport, individual oil operator, president; John J. Frommer, Shreveport, Ohio Oil Co., vice-president; J. T. Goodman, Shreveport, Gulf Refining Co., vice-president; D. W. Harris, Shreveport, Arkansas Natural Gas Corp., vice-president; L. M. Moffitt, Shreveport, Triangle Drilling Co., vice-president; Ray O'Brien, Shreveport, O'Brien Bros. Inc., vice-president; and Arthur R. Campbell, Shreveport, secretary-treasurer.

J. A. Vickers Dies

Funeral services for J. A. Vickers of Wichita, Kans. Founder and President of Vickers Petroleum Co., will be held Nov. 13 from his home East of Wichita. Mr. Vickers, who in 1918 founded the company that bears his name, died Armistice Day. He leaves his wife, 8 children and his father.

WITH THE ASSOCIATIONS

Defense, Diesel Power, and Aviation Hold Attention of Tulsa SAE Meeting

N. P. N. News Bureau

TULSA, Nov. 12.—Close cooperation between automotive engineers and the oil industry has been established and both groups stand ready to meet the challenge for national defense, John A. C. Warner of New York City, general manager of the Society of Automotive Engineers, told the S. A. E.'s Fuels and Lubricants Division meeting here Nov. 7 and 8.

"Preparing for peace, through proper defense, is something we've been doing for more than 20 years," the S. A. E. official added.

In preparation for national defense, the War Department requires approximately 186,000 land vehicles to carry out mobilization plans and the department visualizes that tactical transportation will be of the all-wheel drive type of truck unit standardized for military adaptation, Mr. Warner said. He suggested that with the expansion in the air and since a four-engine bomber is as much of a piece of automotive equipment as a truck, all manufacturers of self-propelled vehicles collaborate on such important problems as mass production methods.

Separate Oil for Diesels

A single heavy duty oil for diesel motors and another for gas engines was suggested by H. R. Wolf of Detroit, General Motors Research, in his paper on "Crankcase Oils for Heavy Duty Service." The reseacher discussed characteristics of crankcase oils and demonstrated with samples what happens when a car owner drains his crankcase of its badly oxidized oil. He showed how the addition of a highly refined paraffinic oil to the crankcase containing left-over oxidized oil, resulted in deposits of a resinous material that caused "sticking."

It was suggested that if drain was made after a long hard drive had heated up the motor and oil, that there was less likelihood of trouble from "sticking." Discussion at the close of the paper also brought the suggestion that flushing might aid in doing away with a greater volume of the old oil.

Lubricating grease—the "Last of the Mohicans" as far as petroleum products are concerned—represents a fertile field for research and development that should push aside some of the mystery that has surrounded this product. This was the conclusion of M. B. Chittick of Chicago, Pure Oil Co. to his paper on "Rationalizing Lubricating Greases." A more rational approach to clearing up misunderstandings is necessary, he stressed, suggesting work be done as regards to consistency, structure, physical and chemical stability.

Aircraft Upkeep Discussed

Makers of light aircraft face and must overcome the bugaboo of maintenance costs as automobile manufacturers did, R. W. Rummel of Kansas City, Rearwin Aircraft & Engines, Inc., told the S. A. E. delegation. As use of light aircraft increases, maintenance cost will gradually be reduced and before many years will be a minor consideration by operators, he said. Meanwhile, it was suggested manufacturers assist owners and maintenance agencies in servicing their products, continuing to solve by re-designing any faults that may add to maintenance costs.

The "trials and tribulations" of the Burlington Transportation Co. which pioneered in 1939 the switch in cross country bus

Tennessee Oil Men Elect New Officers for 1940-41

Officers of the Tennessee Oil Men's Assn. for 1940-41 are: H. L. Thatcher, Chattanooga, president of H. L. Thatcher, Inc., president; Phil Rosenfield, Nashville, Southern Oil Service, secretary-treasurer for second term; Alfred T. Levine, Nashville, general counsel; G. B. Dickey, Nashville, American Oil Co., and James P. Davidson, Memphis, Memphis Oil Co., vice-presidents.

Directors are: R. S. Kennedy, Knoxville, Kennedy Oil Co.; L. D. Stapleton, Athens, Pure Oil Co.; Jack Cummins, Nashville, Cumberland Oil Co.; Horace Allen, Murfreesboro, H. P. & F. E. Allen, Dist.; and Hall Galloway, Milan, Westate Oil Co.

The T. O. M. A. held its annual meeting at Chattanooga, Oct. 30 to Nov. 1.

(For additional information about the fall meeting of the Tennessee Oil Men's Assn., held in Chattanooga, Oct. 30 to Nov. 1, see NPN, Nov. 6, 1940, page 19.)

Officers and some of the directors of Tennessee Oil Men's Assn. for 1940-41 *are shown above. From left to right, they are: Standing, L. D. Stapleton, director; S. H. Cambell, past president; J. F. Cummins, director; R. S. Kennedy, director; Alfred T. Levine, general counsel; seated, G. B. Dickey, retiring president; H. L. Thatcher, president, and Phil Rosenfield, secretary*

S.A.E. Men Gather for Informal Conversation

S.A.E. national officials, local S.A.E. members and several speakers on the National Fuels and Lubricants meeting program are shown above. Seated at the left is John A. C. Warner, New York City, general manager of S.A.E., and C. S. Hansen of Bartlesville, Phillips Petroleum Co. Standing, left to right, are M. B. Chittick, Chicago, Pure Oil Co.; R. W. Rummel, Kansas City, Mo., Rearwin Aircraft and Engine Co., Inc.; Ralph R. Matthews, Kansas City, Battenfeld Grease & Oil Corp.; and W. A. Taussig, Chicago, Burlington Transportation Co.

Seated at the right is Ed Lowe, New York, S.A.E. staff member, joshing with Ulric B. Bray, consulting chemist and engineer from Los Angeles. Standing in back and listening to G. C. Richardson of Bartlesville, Indian Territory Illuminating Oil Co., spring his "best one with jestures", (left to right) are Frank Suess, Ponca City, Continental Oil Co.; T. P. Sands, Pittsburgh Gulf Research & Development Co., Inc.; Mr. Richardson; W. H. Hubner of Detroit, Ethyl Gasoline Corp.; and E. R. Barnard of Chicago, Standard Oil Co. of Indiana

equipment from gasoline to diesel motive power were told by W. A. Taussig of Chicago, engineer for the Burlington company.

Diesel Failure Cited

During the second month of the change-over to diesel power, the Burlington engineer told of 30 road failures in his fleet of 21 busses, concluding that the same engines that had given satisfactory service in the city "failed miserably" on fast interstate schedules, particularly on long grades at high altitudes. Trouble, he continued, centered around seizure of blower rotors and pistons and the damage resulting from excessive engine speeds. "The only prompt means of solving the problems so that dependable service could be obtained was to undertake wholesale experimentation in the field," Mr. Taussig said. Experiments resulted in many improvements in design and in preventative maintenance.

Experience with lubricating oil in diesel busses led the Burlington engineer to conclude that; (1) a pure unadulterated mineral oil does not produce satisfactory results regardless of quality; (2) any oil that breaks down in service into corrosive compounds must be treated with neutralizing corrosion inhibitors to protect copper-lead engine bearings; (3) most, if not all lubricating oils, require the addition of an oxidation inhibitor; and (4) a detergent is necessary to scour varnish-forming compounds from piston walls and from cylinder liners.

Diesel Fuel Tests Show Need For Clean Non-Corrosive Oil

Tests of diesel fuel in bus operations indicated the necessity for a "clean," non-corrosive and "oily" fuel of uniform specification, according to the Burlington engineer. Distillation range of fuel is of importance and must be considered together with the cetane number. Lower cetane numbers can be tolerated with fuels having lower distillation temperatures for their heavier fractions, he added. It was recommended that the fuels and lubricants division of S. A. E. could assist bus operators by setting up sample specifications for fuels suitable for automotive two-stroke cycle diesel engines, considering such factors as types of operation, altitudes and atmospheric temperatures.

In summary, Mr. Taussig said the experimentation of the manufacturer and user of diesel busses had resulted in transforming an engine that was considered a failure to a reliable prime mover. "The operator purchased more diesels and believes they are practical and economical," he added. "But if diesel is to survive as a prime mover in long distance bus service, there must be no appreciable increase in fuels costs," he warned.

To the rescue of the diesel user, harassed by fuel, lubricant and maintenance problems, came L. A. Blanc of the Caterpillar Tractor Co. and Ulric B. Bray, Los Angeles consulting chemist, who spoke on fuels and lubricants for the diesel.

Re-design of Injection System

Dr. Blanc told of experiments the Caterpillar company had made in its efforts to see if by the use of "dopes" the ignition qualities of diesel fuels could be improved at low engine speeds.

The experiments and survey, he said, show the possibility in additives to fuels, but those possibilities are overshadowed by what could be done by re-designing the injection system of the diesel unit. A final solution of the fuel problem at low speeds is either in such re-design that would improve performance or a combination of a special "doped up" fuel and the re-designed system, he concluded.

Diesel Lube Requirements

In describing the essential requirements for diesel lubricants, Mr. Bray made the following conclusions:

(1) In practical operation, detergency is believed to be first in importance, since presence of such a factor prevents sticking by "floating out" any dirt present in the lubricating system. Compounds that impart detergency include oil soluble soaps, salts of true organic acids, certain organic metal compounds and complex organic compounds containing no metal.

(2) High film strength, defined as having "anti-welding" properties, is also desired, preventing destructive scratching or scuffing due to welding of rings to liners when the lube film is ruptured. "Engine builders need all the insurance against scuffing and scratching that can be furnished by nature of both the oil and the engine parts," he said in stressing the importance of film strength.

(3) Oiliness is necessary to prevent wear where scratching or scuffing is not a factor. Compounds used to reduce wear may be classified as "oxygenated compounds," he said.

(4) Low carbon forming tendencies of oil is of increasing performance as more power is taken from the diesel engine and the oil is subjected to greater temperature abuse. Ideal paraffinic stocks would be given preference as far as inherent oxidation resistance is concerned, but the up-to-date procedure is to bolster up the inherent qualities of the base oil with the addition of inhibitors regardless of base stock used. The ideal inhibitor may not have been invented as yet, but there are several good methods of improving oxidation resistance at present.

Superior Economy

Speaking of the advantages of diesel versus gasoline motive power, L. T. Knocke, chief diesel engineer for Chrysler Corp., pointed out that economy of diesel operation constituted its greatest superiority.

Actual operating tests, according to Mr. Knocke, showed the total fuel and lube cost per 1000 miles for a group of three diesel units was $18.92 compared with $40.57 for gasoline-propelled units. Lower maintenance costs featured the gasoline units, it was said, but com-

parison of total operating costs, including depreciation, revealed a saving of $15.90 per 1000 miles on the diesel operated units.

Still greater gains in diesel motive power were predicted by the Chrysler engineer as diesel engine production increases and initial cost of engine and accessories is reduced.

The "Second Coming of Aviation" was envisioned by William B. Stout of Detroit, Stout Engineering Laboratories, Inc., as the private ownership of "jalopy" airplanes. "When they can turn out 100 $100 airplane engines per day and build around those motors a plane that will sell for $1000 or less, we will see the second coming of aviation," the airplane engineer predicted. Injecting politics into his talk, he predicted too that the day of the politician was fast drawing to a close. And since scientific research will be the keyword in the future, it is clear that the scientist will take over the responsible positions within the government, he continued. "And, as the politician is seen walking down the road to the West along with the outmoded horse, it will be difficult to differentiate between the two," he concluded.

A debate on the question "Resolved: That Higher Compression Tractor Engines are to be Preferred for Tractor Power Equipment" featured the last dinner session of the S. A. E. group. Kansas State College debaters, upholding the affirmative of the question, won over the University of Oklahoma team.

Last week's meeting drew the biggest crowd of any meeting previously held by the Fuels and Lubricants Division of S. A. E., it was said.

No Overproduction In U. S. Declares Thompson

Special to N. P. N.

AUSTIN, Nov. 12. — There is no overproduction of oil in Texas or in the nation, Commissioner Ernest Thompson declared today. Thompson cited figures to show that for last two weeks nation was slightly under Bureau of Mines estimate and Texas only 1200 bbls. over.

Average Texas daily production the last two weeks was 1,292,275 bbls. he said, only 1200 bbls. over estimate. Average national daily production for same period was 3,526,673 bbls., which is 43,000 bbls. under estimate, he asserted.

Mr. Thompson declared that next two weeks will see Texas considerably under Mines estimate. "There is no overproduction in Texas today. The market is firm. There is strong demand," Thompson reiterated.

Southeast Pipeline Faces Stiff Legislative Battle

N. P. N. News Bureau

TULSA, Nov. 12. — The big question of whether gasoline pipelines should have the right of eminent domain through Georgia will be thrown into the laps of Georgia's legislature, scheduled to convene early this coming January.

The Georgia Supreme Court has ruled that the Southeastern Pipe Line Co., which has completed portions of its proposed gasoline line from Port St. Joe, Fla., to Atlanta and Chattanooga, was not granted authority to condemn property for its pipeline by legislative action.

A bill is expected to be introduced in the Georgia legislature that would either clear up "technicalities" existing in the present legislation or provide explicitly for rights of eminent domain to pipeline in an entirely new bill. Stiff opposition to any such legislation by railroads and groups in Georgia's port cities is expected to precipitate a "battle royal" that will be watched with interest by companies which are now considering pipeline construction in the Southeast.

Feelings Run High

A barrage of pamphlets and newspaper advertisements indicates intense interest by both sides. A point stressed by the opposition to the pipeline is that lines are not common carriers in the true sense of the word, and they should not be granted the rights of eminent domain afforded public service facilities. No extension of railroad, bus, truck or airplane routes may be initiated, the rail group contends, without findings of state or federal boards that such facilities furnish new or better service to unserved areas.

To these contentions, the pipelines reply that rights of eminent domain are granted by neighboring states and that rails themselves have permitted pipelines, as routine procedure, to cross under rails' rights of way. Pipeline advertisements maintain that to prevent completion of the gasoline line is to place barriers in the path of progress. Use of pipelines in the interests of national defense is also stressed by pipeline officials.

Railroad Group Confident

Confident that the battle of eminent domain for pipelines would be fought in the next legislature, railroad groups claim a 66% majority of Georgia's legislators are against legislation favoring pipelines. This group also claims 103 out of Georgia's 159 counties, through their county commissioners, have taken a stand against favorable pipeline legislation.

Pipeline officials discount these claims, reporting that only a "handful of resolutions—no more than a dozen" have been publicly exhibited and that in some cases they were withdrawn when signers of the resolutions were "given the opportunity to hear something on the other side of the question."

Pipeline officials say there is "not the slightest foundation" for claims by rail groups that the pipeline would deprive rails of 10% of their revenue and that employment would be affected to the same extent and degree as revenue.

The rail group claims, however, that if Southeastern Pipe Line Co. is granted right of eminent domain, the door would be opened for construction of other pipelines, including one now contemplated from Shreveport through the middle of Georgia to Atlantic ports.

Panhandle Raises North Texas Crudes

N. P. N. News Bureau

TULSA, Nov. 12. — Panhandle Refining Co. late last week announced a 3.5c to 15.5c a bbl. increase in its posted price for North Texas crudes retroactive to Nov. 1.

Company's new at-the-well price begins with below 29 gravity at 78.5c and increases 1c for each degree of gravity to 90.5c for 40 gravity and above.

In announcing the advance, M. A. Chambers, Panhandle's vice president, said the "company will pay transportation charges and this change in price results in an increase of 3.5c a bbl. for crude below 29 gravity, to 15.5c a bbl. on crude oil of 40 and above gravity, above the prices in effect prior to Nov. 1, 1940."

Last June the Panhandle reduced its posted price to 75c a bbl. for all gravity crudes purchased for its Wichita Falls, Tex., refinery. It was announced at that time that a "disproportionate relationship" between the price paid for crude and the sales price obtained for the refined products necessitated the downward revision in crude prices.

Panhandle's new price schedule is below that posted by Stanolind in North Texas which begins with 63c for 21 gravity and increases 2c for each degree of gravity to $1.03 for 40 and above.

Delaware and Pennsylvania Fuel Oil Prices Advanced

PHILADELPHIA, Pa., Nov. 11.—Atlantic Refining Co. has announced that effective today, its posted tank car and tank wagon prices for Nos. 2 and 3 fuel oils throughout Delaware and Eastern Pennsylvania will be increased 0.25c per gal. At the same time, posted tank car prices for kerosine throughout the same area will be advanced 0.25c, a company official said.

U. S. to Canada Rate For Venezuela Oil Is Filed With ICC

N. P. N. News Bureau

WASHINGTON, Nov. 9. — Joint rate of 35c per bbl. for the transportation of foreign crude from Marcus Hook, Pa., to the refinery of Imperial Oil, Ltd. at Sarnia, Ont., has been filed with the Interstate Commerce Commission by Susquehanna Pipe Line Co.

Effective Dec. 1, rate applies from Twin Oaks, Pa., (near Marcus Hook) over the facilities of Susquehanna Pipe Line Co., Buckeye Pipe Line Co., National Transit Co., Northern Pipe Line Co. and Transit and Storage Co. via Colegrove, Pa., and Cygnet, Ohio, to the international boundary 1.5 miles south of Port Huron, Mich.

Tariff specifies the 35c rate is limited to foreign oil received in tankers and is subject to a tender of 100,000 bbls. Imperial expects to begin shipping 10,000 bbls. of Venezuelan crude daily Dec. 1, if final U. S. Customs clearance is obtained by that time. Crude would not be subject to 21c import duty.

Meanwhile an official of Standard Oil Co., New Jersey, parent company of Imperial reported that Imperial's refineries in Eastern Canada already are operating almost exclusively on Venezuelan and Colombian crude. Movement of this crude by tanker from South America to Canada has not been impaired by the war, he added.

Imperial's Venezuela crude will be unloaded into tanks of Sun Oil Co. at Marcus Hook and moved from that point through the lines of the Susquehanna Pipe Line Co. and other companies involved to Sarnia. Crude is produced in Venezuela by International Petroleum Co., South American subsidiary of Imperial.

Oil Price Basing Structures Discussed in TNEC Report

N. P. N. News Bureau

WASHINGTON, Nov. 11.—The geographic price structure for petroleum products is not as well defined nor adhered to as that for most other products, and this is due partly to the frequent discovery of producing fields, is the conclusion of E. S. Mason, Saul Nelson, and Walter Keim, Bureau of Labor Statistics, authors of the TNEC (Monopoly Committee) report "Price Behavior and Business Policy."

The report, which will be published shortly, is designed to provide the factual basis needed for the appraisal of the adequacy of existing anti-trust legislation to cope with geographic practices which may seem to impair the efficiency of price competition, the authors state. No recommendations, however, are made in the report.

Following is the text of the report pertaining to oil markets:

"The geographic price structure for petroleum and its products is not as well defined nor adhered to as that for most of the other non-agricultural conditions due partly to the frequent discovery of producing fields probably prevents practice from crystallizing.

"In general, crude oil is f.o.b. producing field, while gasoline is usually quoted on a delivery basis. Methods of marketing these products were described in detail at hearings before the Temporary National Economic Committee held during October, 1939, and consequently only the outstanding practices will be described here.

"*Crude oil.* Prices for crude oil at each field are nominally based upon a posted price set by one or more purchasers. The number of refiners obtaining crude oil from any one field is usually quite limited, and some one of these acts as the leader in posting prices, as a witness for industry phrased it, the interpreter of market conditions. (Testimony of William S. Farish, President of Standard Oil in New Jersey, Verbatim Record of the Proceedings of Temporary National Economic Committee, vol. 7, page 427). Of course, competition for supplies between differently located refiners is an important factor in determining the posted price in any field and the system itself, insofar as it is adhered to, may have some effect in preventing prices from being bid up by this kind of competition between buyers.

"Although prices posted by all refiners in any single field at any one time for oil of a designated specific gravity are usually identical, this does not mean that all transactions take place at this price. If the market is weak, some sales will be made at a discount; if the market is strong, some oil may move at a premium. Of course, when the posted price comes to be honored in the breach more than in the observance, it is adjusted, and over any long period of time it is probably that the bulk of crude oil moves at the posted price level. According to one witness for the industry, 'at such times as much as 20 per cent, at times practically none' is sold at levels below the posted price. (Ibid, vol. 11, p. 571).

"*Gasoline.* The geographic price structure for gasoline varies in different sections of the country. There are ten basic refining districts in the United States, in which three, the Gulf (including the Louisiana and Texas refining districts), the 'Group 3' (comprising primarily Oklahoma, Texas, and Missouri), [sic] and the Pacific Coast, are the most important. Of these the Gulf district shipping by water, supplies most of the Atlantic seaboard. Group 3 governs prices through much of the Midwest, and the Pacific Coast supplies part of the Rocky Mountain area in addition to the West Coast. There is some competition between these districts in border areas, in which gasoline from different sources meets; thus parts of Ohio may be served by the Gulf district via the East Coast as well as by the Group 3 refineries. In addition, minor refining districts affect the price structure in many sections; this is true, for example, of the Appalachian area in Pennsylvania, of the Illinois area, etc.

"Quotations for each of these refinery districts are published daily in PLATT'S OILGRAM and usually indicate a range of prices obtained from a number of buyers and sellers.

"In most other districts other than Group 3 delivered prices vary with shipping costs from the refinery, subject however, to a great deal of unsystematic freight equalization to meet competition. For example, some of the Gulf crude is refined along the gulf and shipped as gasoline to Atlantic ports, but some is transported in the form of petroleum to be refined at various points along the eastern seaboard. Gasoline for sale at inland destinations accessible to more than one seaport may, therefore, proceed along various routes and competition is likely to be reflected in a certain amount of unsystematic freight absorption or equalization.

"In Group 3 area, the nominal price is based upon all rail freight from a single basing point at Tulsa, Oklahoma. The development of this structure may be traced to the fact that the rail freight rate schedules, in this area, known as the Group 3 rates, are such that transportation charges to any given destination in the Midwest are the same from any point of origin in the midcontinent area. The delivered price at any destination, therefore, will be the Tulsa price as reported in PLATT'S OILGRAM plus all rail freight from Tulsa. Insofar as shipments are actually made by rail and in the form of gasoline, this result does not differ from what would have been obtained if the quotation were f.o.b. refinery. However, there are two additional means of transportation available, shipment of gasoline from refineries in the midcontinent district by pipeline to destination, and transportation of the crude oil from this district by pipeline to refineries in consuming areas. Both of these methods of transportation are cheaper than all rail freight and neither is reflected in the nominal delivered price structure. Consequently, 'Tulsa plus' practice in the 'Group 3' territory, to the extent to which it is observed, can properly be described as a single basing point.

"Increasing difficulty is apparently being encountered in maintaining this price structure in the 'Group 3' area, primarily because of the development of new fields in Illinois, Michigan, and elsewhere. For this reason, the practice described is probably subject to substantially more variation than is true for such products as steel or cement."

Over 245 Defendants Served in Oil Suit

N. P. N. News Bureau

WASHINGTON, Nov. 12.—Between 245 and 250 defendants have been served with summons in the anti-trust suit filed here Sept. 30 by the Department of Justice against American Petroleum Institute, 22 major oil companies and their alleged affiliates, Justice Department reported today.

This leaves approximately one-third of total of 367 defendants still to be served with summonses by U. S. marshals.

Plan Monthly Check On Oil Employment

N. P. N. News Bureau

WASHINGTON, Nov. 8.—All companies producing petroleum products will be queried once a month on their employment plans for the ensuing 60 days under a program just inaugurated by the Social Security Board.

Purpose of the program is to provide a smoother and more adequate flow of labor from the offices of the U. S. employment service to the defense industries, Board said, by permitting employes to be recruited for defense work without dislocating the labor markets through unnecessary shortages.

Information on employment plans will be obtained from employers in the oil industry by representatives of state employment services who will call for interviews at 30-day intervals, Board explained. Employers will be asked to furnish confidential estimates of numbers of employees which they propose to hire together with occupational skills and other qualifications, as well as confidential information regarding lay-offs.

Stanolind Names Six New Officials

TULSA, Nov. 11.—Ralph O. Dietler has been elected president of Stanolind Oil Purchasing Co. and A. W. Peak to presidency of Stanolind Pipeline Co.

Announcements of these changes follow retirement of Robert S. Ellison, Tulsa, as president of these 2 companies.

B. P. Sibole is the new executive vice-president and active executive head of the pipeline company, while Henry Waters will step up to the vice-presidency of the oil purchasing company.

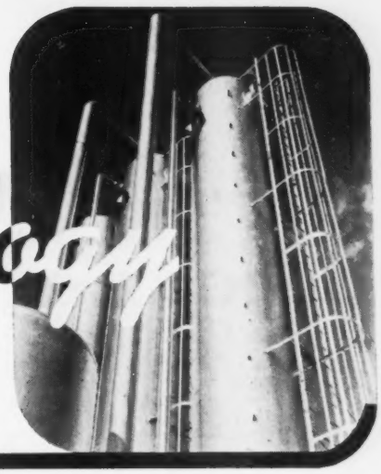
William G. Heltzell is the new vice-president of the pipeline company, advancing from the post of general superintendent. Mr. Heltzell's former position will be filled by J. B. Harshman, now master mechanic.

Mr. Dietler was formerly vice president of the oil purchasing company and will continue as general manager of Standard Oil Co. of Indiana's crude oil purchasing department. Mr. Peake has been board chairman of the Stanolind Pipe Line Co.

All executives involved in today's changes live in Tulsa and will maintain operating headquarters here.

Refining Technology

INCLUDING INTERNATIONAL PETROLEUM TECHNOLOGY



A.P.I. SESSIONS This week the American Petroleum Institute is in session for its twenty-first annual meeting. The Division of Refining this year has prepared a program in which over half of the speakers are presenting data on service quality and performance of motor fuel and motor oil. Much of this material is of as much interest to marketers as to refining technologists.

There is nothing this time on catalytic cracking, a subject which has packed refining sessions the past two years. However, there are important current developments in this field the results of which may be expected to come out later. One of the most interesting of the refining process papers describes a newly developed plant for wax-oil separation with equipment a fraction of the size of that used heretofore. This paper is included in this issue. Additional material on Gulf's Polyform process is also being presented (See NATIONAL PETROLEUM NEWS, Sept. 18, 1940, p. R-330).

One of the oil companies going into the chemical industry in a big way, using petroleum products as raw material, is Shell Oil Co. Some of the company's accomplishments in this field, which bring out the growing importance of synthetic chemicals to refiners, were also told at the meeting. Information on motor fuel requirements as affected by motor design, maintenance, and adjustments, and trends in automotive engine design to match evolution of fuels should hold all refining technologists for the closing session on Friday.

★ ★ ★

VAPOR LOCK IN THE AIR From every standpoint except vapor lock, increase in aviation fuel vapor pressure is desirable, it was pointed out recently in an excellent detailed report of the CFR Aviation Vapor Lock Projects, by Dr. O. C. Bridgeman, director. However the committee studying this problem is more concerned with holding the present specified top limit of 7 lb. than with any thought of increasing this limit, desirable as it may be, it appears from the report.

While the lower vapor pressure would solve the vapor lock problem, availability of high octane fuel is reduced, explosion hazards increased, and starting difficulties intensified, it was pointed out. The so-called "safety fuel" is condemned on these grounds.

Since it is found desirable to hold, at least, the present specification for vapor pressure up to 7 lb. while attempting to improve vapor lock trouble, the committee is studying pressure drops in the fuel system with the object of developing a system of low pressure drop. While the committee has done nothing with fuel pump design and installation, it expects later to co-operate in this work.

AVIATION FUEL SPECIFICATIONS Between the time the last Refining Technology and the news section of the same issue went to press, some significant facts bearing upon the discussion of production of aviation fuel by Socony-Vacuum's catalytic cracker at Paulsboro came out with the release to the public of the new Army-Navy specifications for its aviation gasolines.

The most significant change in these specifications as far as catalytically cracked gasoline is concerned, is the elimination of the acid heat test, a test designed to bar thermally cracked gasoline as a base for aviation fuel. While both types of cracked gasolines contain unsaturated compounds, which this test was designed to detect, those in Houdry gasoline are less in quantity and are believed to be of a type which is at least less undesirable.

A new accelerated gum test is now just as effective as the acid heat test in keeping thermally cracked gasoline out of aviation fuel. If catalytically cracked gasoline of 50°F. acid heat will pass the new gum test, even with an added gum inhibitor, it is now acceptable for 100-octane aviation fuel.

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METALLURGY While there was little of direct value to petroleum technology discussed during the recent Metal Congress and Exposition in Cleveland, a survey of several papers on the program of the American Society for Metals, one of the sponsoring organizations, however, indicate that the conclusions found there must have had or will have an influence in the fabrication of refining equipment, particularly cracking still tubes.

Two speakers showed the effects of molybdenum and columbium on high-temperature alloys. One attributed the higher strength of such alloys to the presence of a critically dispersed precipitate of a stable intermetallic compound. The other, concerned with corrosion resistance of austenitic stainless steels, found that the proportions of alloying components must be balanced to preserve toughness and that in 2% moly steels intergranular corrosion can be avoided by making the columbium content at least six times that of carbon.

A highly technical discussion of the influence of silicon and aluminum additions on 4-6% chrome moly steels was presented. These two elements were said to exert a beneficial influence on the oxidation and corrosion resistance but the principal concern of the authors was whether or not elements of the gamma-loop forming type exert a strictly additive effect when they are present simultaneously in a given steel. Information of this sort was said to be becoming of greater importance with the growing use of intermediate alloy steels in high temperature applications.

Other speakers described studies of the influence of molybdenum on the hardenability of steel and showed that a combination of plots of creep and rupture test results is a convincing means of arriving at safe working stresses for design purposes.

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737

Emulsion Deoiling Process Separates Oil-Wax Mixtures†

By A. H. Schutte*

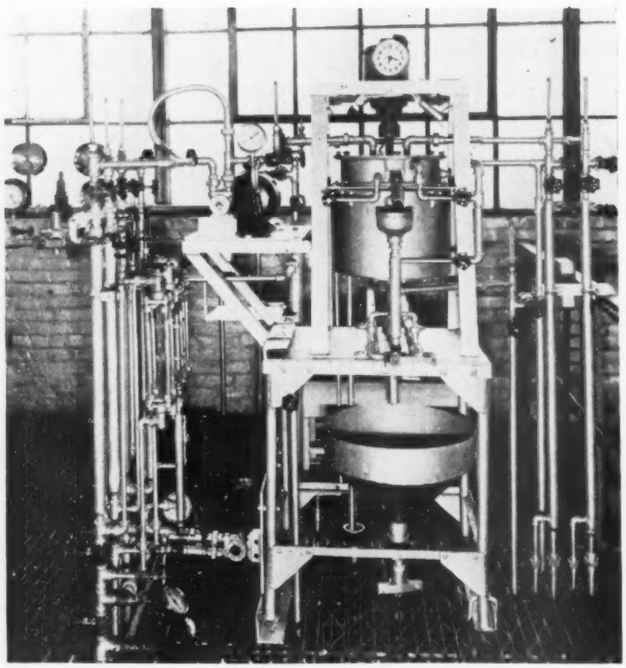


Fig. 4. The pilot deoiling unit uses a 10-inch centrifugal and has a charging capacity of 10 gal./hr.

ABSTRACT

A new process for deoiling crystalline waxes, based on a novel centrifuge for separation of wax and oil in a water emulsion, has been developed. While commercial application of the process has been confined thus far to the deoiling of sweater stocks, the principle permits separation of any clean oil-wax mixture. Two commercial installations, one at the Bradford Oil Refining Co., Bradford, Pa., and the other in the Mid-Continent, are of 400 and 700 bbls. daily charging capacity respectively.

Centrifuges of 48 and 60 inches in diameter for these two plants effect continuous wax-oil separations under automatic control. The process is a matter of minutes, rather than days. Complete equipment for the 400-bbl. unit is contained in a box-car. Plant and operating costs are low, only exhaust steam being required for heating. The method may be applied to the complete processing of slack wax to semi-refined grades, or may be used as an adjunct to existing sweating equipment.

UNLIKE most refining processes, the separation of oil from crystalline waxes by conventional sweating has not been radically changed in the past years, and has been practically without competition in its field. The work of many investigators has increased the efficiency of sweating by extending our knowledge of the factors involved and by improving the control methods. The equipment has been improved by mechanical refinements, but the method of separation has remained the same. Sweating is still a batch fractional melting, carried out on long time-cycles, thermally inefficient and relatively difficult to control.

A new process has now been developed, based on a novel mechanism of wax-oil separation. While the application of this principle permits the separation of any clean oil-wax mixture, the commercial development of the process has thus far been confined to the deoiling of sweater stocks. This has progressed from a pilot plant operation on a wide variety of stocks, to commercial installations of 400 and 700 barrels daily charging capacity. It offers the advantages of continuous operation under automatic control, low operating cost, and low plant cost. It is the purpose of this paper to present this process, describe its theory, the equipment employed, and the results obtained.

Theory of the Process

If any oily crystalline wax stock is cooled to a temperature below its melting point, the wax solidifies in well defined crystals, but the system is not freely separable because the wax crystals impede the flow of the oil, and because the oil adheres to the crystals. An attempt to filter the material results in very imperfect separations and difficulty with plugging of the filter medium. If, however, the oily wax is emulsified in a non-viscous, non-solvent liquid, such as water, and cooled to precipitate the desired wax, with the process so controlled that the water is the continuous phase of the emulsion, then the droplets of oil and the wax crystals are separated by water, and a freely filtering substance is obtained. In practice the cooling and emulsification are usually carried out in the same zone by the addition of the non-solvent liquid at a suitable temperature. The resulting material, which has the appearance of whipped cream, may be subjected to any kind of a liquid solid separation, such as filtration or settling.

The cake deposited on filtration, when the water and oil have been removed, is finely crystalline, porous, and may be washed readily with large volumes of water. A further fractional separation may be obtained by varying the temperature of subsequent water washes. It has been found that one of the most efficient methods of separating these emulsions, is to charge them to a filtering-type basket centrifugal, suitably jacketed for temperature control and equipped with washing nozzles. When washes are used at temperatures considerably higher than the temperature

†Presented at the American Petroleum Institute's annual meeting in Chicago, Nov. 13.

*The Lummus Co.

of the charge emulsion, a partial shrinkage of the cake results in a squeezing action which aids the removal of the last traces of oil. When treated in this way, the cake still retains its porosity, however, and allows a free passage of the wash liquid.

It will be noted that the process has the unique features of employing non-solvent liquids, rather than solvent liquids, rather than solvent liquids, and of utilizing emulsions, which up to now have been considered as undesirable nuisances by the petroleum refiner. In addition to the above mentioned benefits of emulsification, there is apparently an improvement in crystal structure, due to the fact that the wax is solidified from a thin inter-facial film, rather than from the main body of a liquid. This effect has been noted in the commercial deoiling of waxes containing high end-point constituents, which would render them virtually unsweatable. In this case the film crystallization apparently decreases the effect of the naturally occurring inhibitors.

Description of Processing Equipment

The equipment for a single stage emulsion deoiling is shown on the flow sheet, Fig. 1. The oily wax to be processed is introduced by pump G-1 into the suction of the emulsifier G-2. The volumetric capacity of the emulsifier is 10 to 20 times the quantity of wax charged, and this excess material is by-passed back to the emulsifier suction. A small amount of compressed air is introduced with the wax. The temperature of the net emulsion is controlled by an automatic instrument operating on the water introduced to the emulsifier. The proportions of water and wax are adjusted by controlling the temperature of the water in exchanger E-1.

The net emulsion is charged to a perforate-wall centrifugal lined with a filter medium. The unsolidified portion of the original waxy charge and the emulsified water are thrown out and collected in the lower portion of the jacketed housing surrounding the rotor. The deposited cake travels continuously up the wall of the machine as an annular mass and is discharged over the top lip of the basket into a steam-jacketed melting ring, from which it flows to one compartment of tank F-2. The cake may be washed during its progress up the wall of the machine at several levels by water at controlled temperatures. The upper wash material may be withdrawn separately and used as a recycle stock if desired.

The operation of this type of centrifugal may be more clearly seen by reference to the cross sectional cut given in Fig. 2. The machine differs from a conventional

Contents...

REFINING TECHNOLOGY

November 13, 1940

New continuous wax deoiling process, replacing wax sweating, operates by centrifuging water emulsions. A 400-bbl. unit, contained in a box car, is automatically controlled R-402

Manufacture of synthetic chemicals from petroleum and natural gas, a significant factor in development of synthetic gasolines such as iso-octane, has been a major development of the past decade R-409

Soy bean derivative improves stability of leaded and unleaded gasoline and decreases corrosion of storage-tank bottoms, drums, and aluminum fuel tanks in airplanes R-416

Heavy-duty service of copper-lead bearings in automotive engines brought failures during past year due to acidic products in lubricating oils. Metallic soaps in detergent oils found to have catalytic effect on oil oxidation R-418

Advertisers' Index ..... R-419 and 47

Other Editorial Index 5

New Patents R-420

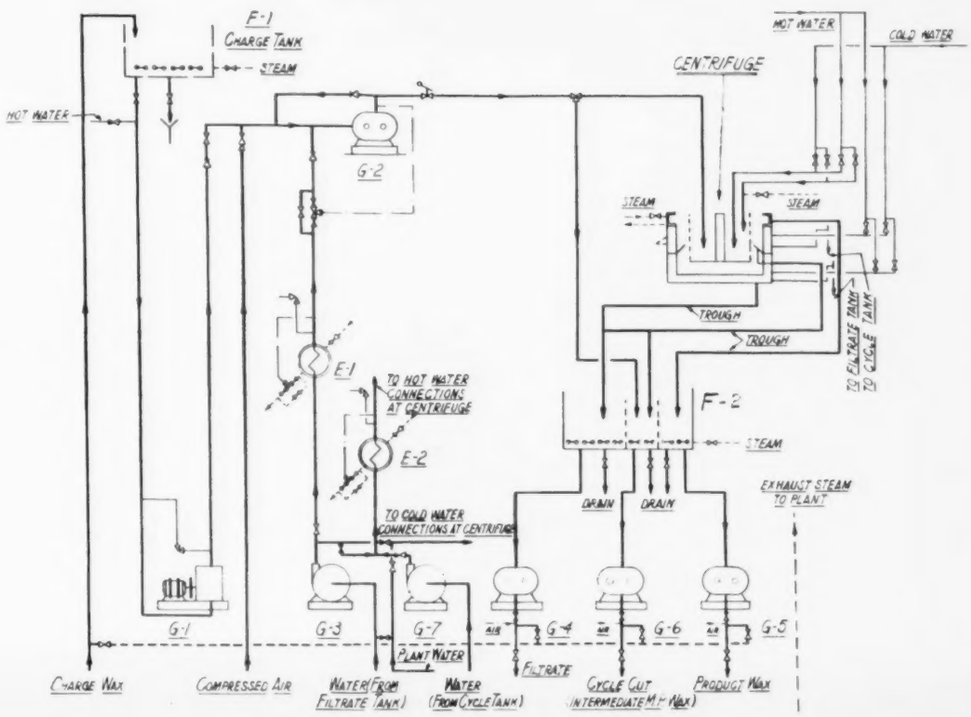


Fig. 1. Flow chart of a single-stage emulsion deoiling unit

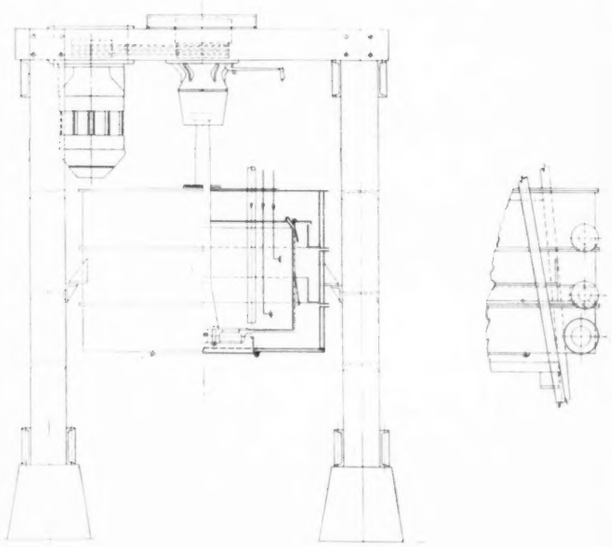


Fig. 2 The machine differs from a conventional basket type centrifugal in that the curb housing is divided into 3 jacketed sections

basket type filtering centrifugal in that the curb housing is divided into three jacketed sections. The top section is steam-heated for cake melting and the other two sections allow control of the temperatures in the primary filtration and washing zones. There is no mechanical means required to propel the cake upward and cause its continuous discharge, since the characteristics of the emulsion cause a self-propulsion of the cake. Due to the presence of emulsified water in the charge, the density of the material at the feed point is considerably greater than the density of the deposited cake. The internal pressure, acting on any particle of dry cake, is considerably less than that acting on a particle of feed slurry. This results in a net upward force in the cake which displaces it as an annular mass upwards along the wall of the rotor. Studies of this action have been made by introducing feed slurries containing insoluble dies. Cakes formed in this way were then cut into strips and removed. The line of demarcation between the undyed original cake and that deposited from the dye-containing subsequent charge is roughly a half-parabola having its axis along the surface of the filter medium.

A view of the pilot deoiling unit is shown in Fig. 4. This uses a 10-inch centrifugal which was remodeled from a standard small laboratory machine. The charging capacity of the unit is 10 gal./hr.

The first commercial plant was built in a railroad box-car, and so designed that the car can be placed on a refinery siding, requiring only the connecting of electrical power and exhaust steam, water, charge, and product lines. This plant was designed for 400 bbls. per day of slack wax and has exceeded this capacity in service. Fig. 5 shows the charge pump, emulsifier, and water heating exchangers. Fig. 6 is a close-up of the centrifugal showing the emulsion charge line, the wash lines, and the troughs which carry off the filtrate, cycle, and overhead cake. This plant has been operating since early in the spring of 1940, at the Bradford Oil Refining Co. Bradford, Pa., producing marketable wax from slack wax obtained by solvent dewaxing. The refinery has no sweating equipment, and this box-car plant, plus clay percolation equipment, constitutes the entire wax plant.

A view of a 60-inch suspended centrifugal in a permanent 700 barrel per day installation is shown in Fig. 7. The photograph shows the wash and jacket water control manifold and part of the instrument board. This unit operates on a Mid-Continent slack wax from plate and frame presses.

Pilot Plant Operating Results

Typical data for pilot plant emulsion deoiling operations on various stocks are presented in Table 1. These stocks include three East Texas pressed slack waxes, Mid-Continent cold pressed slack, Pennsylvania and California solvent dewaxing slacks, and Far East wax stocks. In most of these runs hot washing was used only on the final finishing step, since the pilot unit has no side cut to segregate the hot wash fitrate from the primary filtrate or foots oil. The degree of oil separation obtained on the California solvent dewaxing slack in a single step process is much greater than that shown for the other stocks. This is a reflection of the improvements made in the pilot plant equipment in the last few months.

Fig. 3 is a plot which shows the relationship between the oil content of the charge wax and the oil content of the cake obtained from each deoiling step when hot washing is used on only the final operation. It will be noted that there is a definite and constant relationship between the oil contents remaining after each pass. With the exception of the California slack wax, this relationship indicates the equilibrium obtained in the original emulsion charged to the centrifugal. In the case of the California stock, several improvements have been made in the emulsification system and a heavy, well distributed wash was employed at the charge temperature. The factors influencing the degree of oil separation are as follows:

1. The crude source from which the slack wax is obtained. This effect will be noted by the difference in the slopes of the lines for well fractionated, sweatable, slack wax from various crude sources.

2. The percentage of oil in the original charge.

3. The degree of fractionation obtained in the distilla-

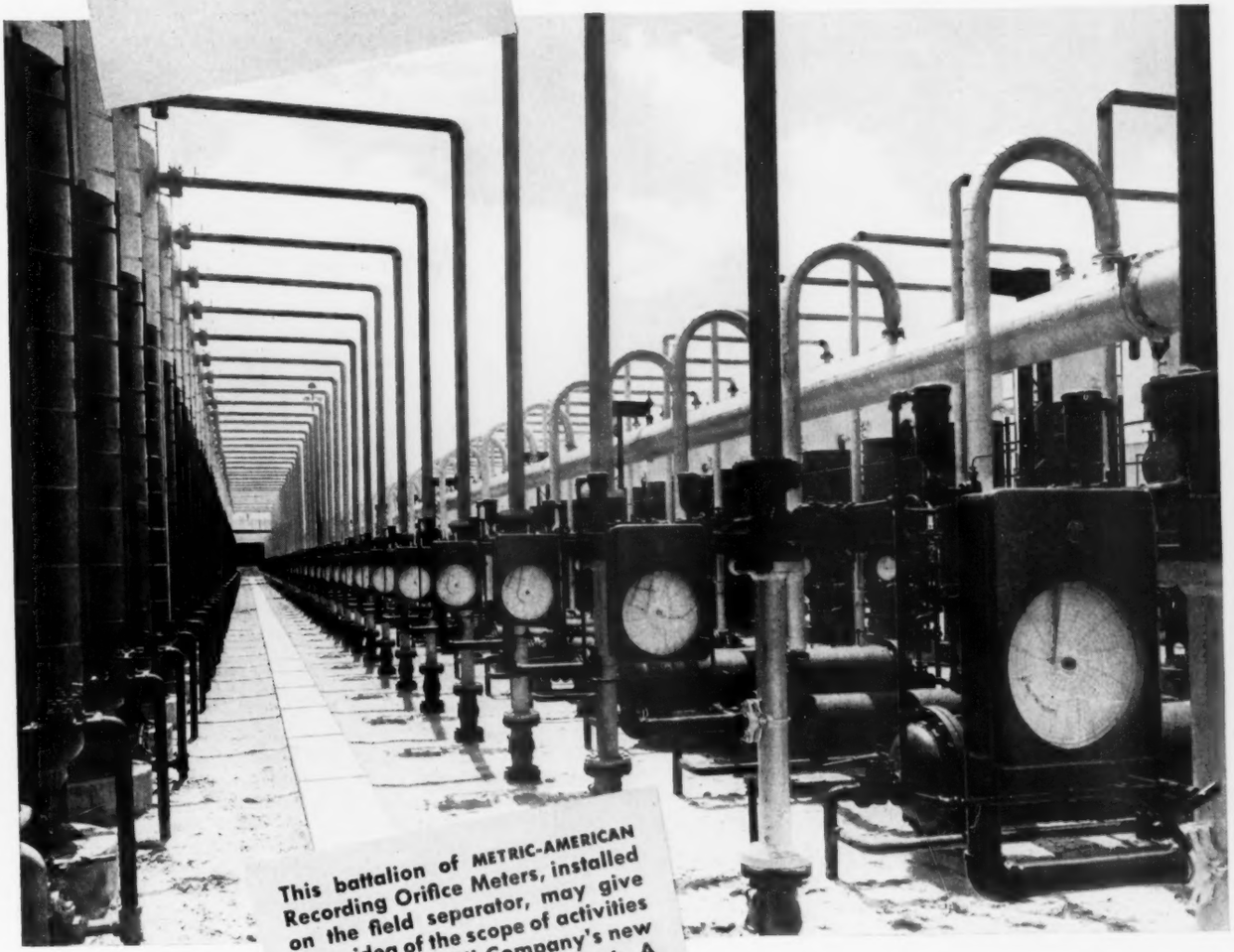
TABLE 1

Typical Data—Pilot Emulsion Deoiling Unit

Charge Stock Source	Charge		Product Wax		Yield Vol. % on Charge	Number of Deoiling Steps
	Melting Point	% Oil*	Melting Point	% Oil*		
1. E. Texas Pressed Slack Wax	107	26	122.5	1.7	40.2	3
2. E. Texas Pressed Slack Wax	107	26	129 5	0.5	25.8	5
3. E. Texas Pressed Slack Wax	112.5	30	122.5	10.7	57.5	1
4. M.C. Cold Pressed Slack	96	(too high)	115.5	11.8	13.3	1
5. M.C. Cold Pressed Slack	96	(too high)	105	34	36.0	1
6. Penn. Solvent Dewaxing Slack	122.5	(10.0)	127	(0.7)	62.0	1
7. Penn. Solvent Dewaxing Slack	122.5	(10.0)	130	(0.2)	41.5	1
8. Penn. Slack Wax	115	(20)	122.5	(5.5)	72	1
9. M.C. Pressed Slack Wax	108	35.6	115	16	71	1
10. M.C. Pressed Slack Wax	108	35.6	119.5	5.5	43.8	1
11. M.C. Pressed Slack Wax	108	51.4	118	26.6	51.4	1
12. Far East Wax Stock No. 1	99	32.6	107	13.6	34	1
13. Far East Wax Stock No. 1	99	32.6	109	7.3	24.8	2
14. Far East Wax Stock No. 2	116	11.8	118.5	7.1	86.5	1
15. Far East Wax Stock No. 3	135.1	3.9	138.5	1.2	72.2	1
16. M.C. Pressed Slack Wax	108.5	36	117.6	16.5	64.1	1
17. E. Texas Pressed Slack Wax	105.6	42.2	115.8	20.3	60.2	1
18. California Solvent Dewaxing Slack	121.6	25.1	128.7	2.0	59.0	1

*Oil contents run by modified ASTM procedure using special light cloth, correlated with solvent method. Oil contents enclosed by parentheses run by ASTM method D-306-29T.

INDUCTED INTO HARD SERVICE



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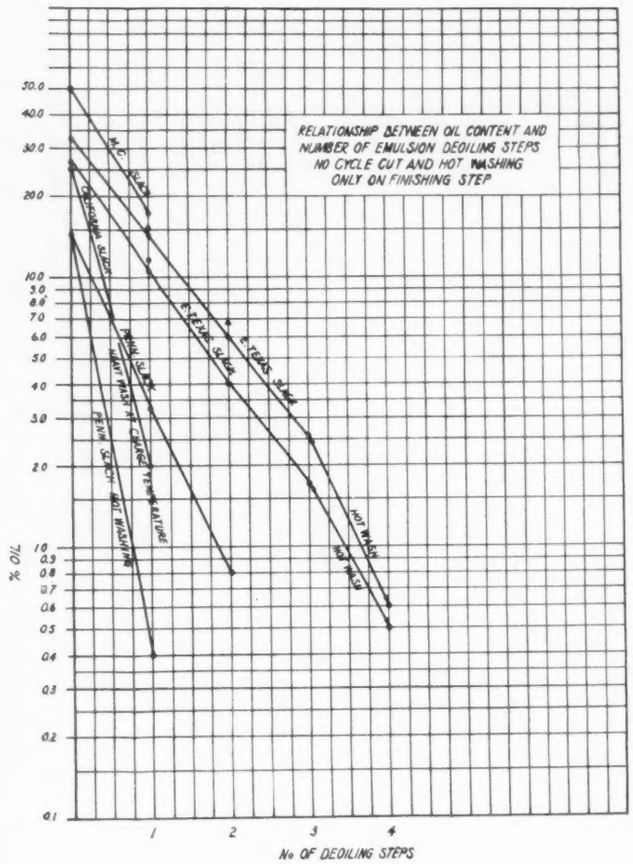
RELATIONSHIP BETWEEN OIL CONTENT AND NUMBER OF EMULSION DEOILING STEPS NO CYCLE CUT AND HOT WASHING ONLY ON FINISHING STEP
% OIL
No OF DEOILING STEPS
HOT WASH
HOT WASH

Fig. 3. There is a definite and constant relationship between the oil contents remaining after each pass

tion unit which produced the original wax distillate. As pointed out previously, this effect is less important in emulsion deoiling than in conventional sweating. Poorly fractionated slack wax usually gives no trouble with operation in emulsion deoiling, but the structure of the final product wax is apt to be poor. The curves of Fig. 3 are given to show the relationship between the oil content of the charge and that of the solid phase in the original emulsion and they do not represent the ultimate separation possible by washing and by the segregation of the hot wash filtrate.

TABLE 2

Pilot Plant Data—Single Stage Emulsion Deoiling Followed by Sweating

Emulsion Deoiling Operation—Once Through

	E. Texas Pressed Slack Wax
Charge	
M.P., °F.	112.5
% Oil	29.8
Cake	
Yield, Vol. % on Slack	57.5
M.P., °F.	122.5
% Oil	10.7
Filtrate	
Yield, Vol. % on Slack	42.5
M.P., °F.	93

Single Sweating Operation

	Cut No. 1	Cut No. 2	Cut No. 3	Semi-Refined
Vol. % on Deoiled Cake	20.6	2.1	38.3	39.0
Vol. % on Orig. Slack	11.9	1.2	22.0	22.4
M.P., °F.	95	115.5	123.8	132.0
% Oil	....	15.6	0.8	0.14
Tensile Strength, psi.	....	....	....	412

Table 2 gives the result obtained by a single stage emulsion deoiling of an East Texas pressed slack wax, followed by a single laboratory sweating. The original slack charged to the emulsion deoiling operation had a melting point of 112.5° F., and contained 29.8% oil. A yield of 57.5% of cake was obtained with 122.5° F. melting point, and an oil content of 10.7%. This cake sweated to 22.4% on the original slack of 132° melting point semi-refined wax, having an oil content of 0.14% and over 400 psi. tensile strength. The next cut of 22.0% on the slack was of 123.8° melting point, 0.8% oil. This shows that stocks which have been partially deoiled by the emulsion process give good separations upon subsequent sweating and yield products of high quality.

Commercial Operations

The results obtained from the commercial operation of an emulsion deoiling plant having a 48-inch centrifugal, are given in Table 3. The charge stocks were obtained from solvent dewaxing of Pennsylvania distillates and the plant was usually operated for a high melting point crude scale product. It will be noted that the overall yield was 60.6% of 130° F. melting point scale wax, containing 0.4% oil. The operation shown in column "C" is of interest because of the high degree of separation obtained on a

TABLE 3

Plant Data—Emulsion Deoiling Operations—Commercial Operation 48-in. Centrifugal

	A B-A Slack Wax from 125 Vis. Dist.	B Cycle from A	C B-A Slack Wax from 50% 80 Vis.-50% 250 Vis. Dist.	D Accumulated Filtrate from Other Operations	E Cake from D	F B-A Slack from 155 Vis. Dist.
Charge Stock						
M. P., ASTM	125-127	124	118.6	114.4	123	120
% Oil, Press Method	4-11	5	14.3	21	1.3	6
E.P. 10 mm.	590-615	...	680-700+	...	...	...
Cake						
Vol. % on Charge	52	45.2	47.3	48	52	43
Vol. % on Slack Wax	52	8.6	47.3	...	...	...
M.P., ASTM	130-131	129.1	128.6	123	129	130
% Oil, Press Method	0.4-0.7	0.4	0.4	1.3	0	0
Filtrate						
Vol. % on Charge	29	54.8	52.7	52	...	...
Vol. % on Slack Wax	29	10.4	52.7	...	...	...
M.P., ASTM	118	118.8	110	...	...	...
% Oil, Press Method	...	13.3	...	106	...	...
Cycle						
Vol. % on Charge	19	...	...	...	...	...
Vol. % on Slack Wax	19	...	...	...	...	...
M.P. ASTM	124	...	...	...	...	...
% Oil, Press Method (A and B)	5	...	...	...	...	...
Overall Scale Wax, Vol. % on Slack	60.6		...	...	...	...
Overall Filtrate, Vol. % on Slack	39.4		...	...	...	...
Charge Rate, B/D	396	495	...	430	430	400
Lbs./hr. exh. steam	660 (40/bbl.)	...	...	...	...	...
G.P.M. Water, No Reuse	19 (69 gals./bbl.)	...	...	...	...	...
K.W.H. Power	26.5 (1.62 KWH/bbl.)	...	...	...	...	...
Utility Costs						
c/bbl. Slack, Steam*	1.000					
c/bbl. Slack Water	.035					
c/bbl. Slack Power	.81					
	1.845					

*Steam at 25c/1000 lbs., water at 0.5c/1000 gals., power at 0.5c/ KWH.

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BREAKING STRENGTH	Resistance to breaking is important in guarding against damage during transportation and installation. Certain services also demand more than ordinary toughness in insulations. Many J-M materials have unusually high resistance to breaking, as measured by transverse strength.	✓
FULL THICKNESS	For maximum insulating protection, the insulation you use must not sag or compress during application, or deteriorate in service. J-M Block and Pipe Insulations are designed to avoid such dangers . . . and they can be applied without risk of voids or thin spots.	✓
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Check the Characteristics of these J-M Insulating Materials

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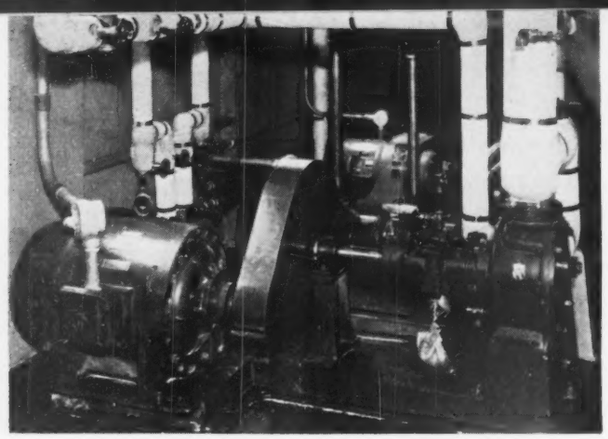


Fig. 5. Charge pump, emulsifier, and water heating exchangers in the 400-barrel unit

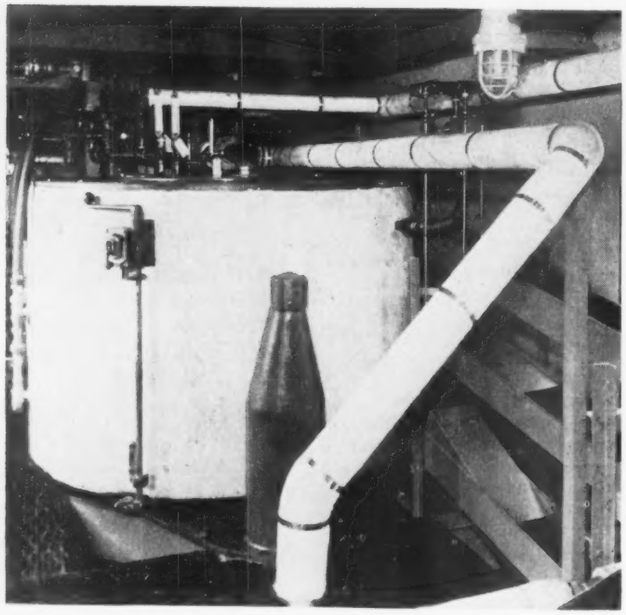


Fig. 6. A close-up of 48-inch centrifugal in a box-car shows the emulsion charge line, the wash lines and the troughs carrying filtrate, cycle, and overhead cake

Fig. 7. The 60-inch suspended centrifugal is in a 700-barrel installation

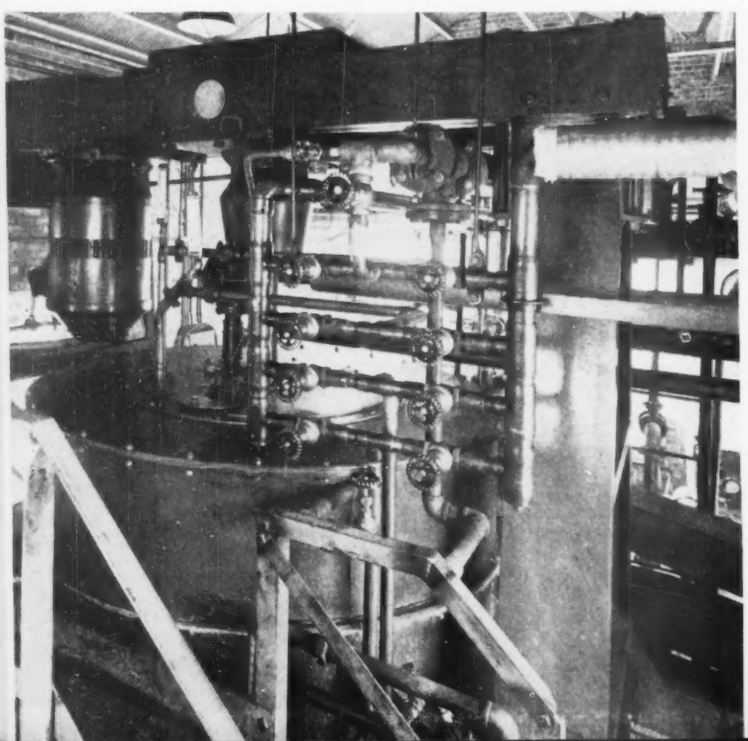


TABLE 4

Plant Data—Emulsion Deoiling Operations—60" Centrifugal

Charge	Slack Wax from M.C. Crude	Sweater Foots Oil
Thruput, B/D	620 (750 gross)	338
Vol. % Cake on Charge	68.0	14
Charge Inspections		
M.P., °F. ASTM	106.8	86
% Oil, Press Method	45+	(cold test)
Cake Inspections		
M.P., °F. ASTM	116.5	113
% Oil, Press Method	16	26
Filtrate Inspections		
M.P., °F.	85	81
Cold Test, °F.	82	80
Cloud Test, °F.	85.8	81.5
% 122 M.P. Wax, Solvent Method	14.3	10.5
Direct Operating Cost, c/bbl. charge		
Power 1.3 KW/bbl.	1.0	2.5 KW/bbl. 1.62
Water, 77° F. 345 Gals./bbl.	0.17	Reused
Refrigeration	....	36.5 Tons* 1.69
Labor 1 Man/Shift	3.0	1 Man/Shift 7.10
Total	4.17	10.41

*Based on reuse of water and net cooling by steam jet refrigeration. Water @ ½c per 1000 gals., 77° F. Power @ ½c per KW.

charge material containing high end point waxes which would normally be unsweatable. The oil separation from 21% to 1.3% upon rerunning the fitrate, is also of interest. The operation in column "F" shows the production of a semi-refined wax in a single step from solvent dewaxing slack.

Reference to the utility data shows an economy of operation in marked contrast to conventional sweating; as evidenced by the overall utility cost of only 1.8c to 1.9c per barrel of charge.

THE operating performance for a deoiling unit employing a 60-inch centrifugal is given in Table 4. Typical operations are shown for Mid-Continent pressed slack wax and for the rerunning of sweater foots oil to recover the scale wax contained therein. The operation on an 86°F. cold test sweater foots oil producing an 80° cold test filtrate and a 113° F. melting point cake, is of particular interest and demonstrates a versatility which should be of value in plant practice.

A distinguishing feature of emulsion deoiling is the compactness of the equipment, as evidenced by the installation of a 400-B/D unit in a box car. All process heat requirements are met by low pressure exhaust steam and therefore wax production capacity is obtained without additional boiler load. The equipment may be operated at emulsion temperatures within 4° to 5° of the cooling water temperature. Refrigeration, therefore, is required only when the plant cooling water temperature is above approximately 80° F. Based on representative refinery utility costs, the total direct operating cost including labor is only 4 to 5 cents per barrel of charge for a single stage operation of the type shown in Table 4. This operating cost is far lower than that usually encountered in conventional sweating. The operating cost of 10.4c per barrel for rerunning the foots oil shows a saving over conventional methods of recovering this wax.

The following patents on Emulsion Wax Separation processes have been issued to Schutte, numbers 2,168,140; 2,168,141; 2,168,142; 2,168,143; and 2,168,306.

Shell's reactor plant at Dominguez, Cal., where alcohol, ketones, and acetates are produced

Petroleum Synthetics Help 100-Octane Fuel Production†

By L. Rosenstein*

ABSTRACT

Entrance of the petroleum industry into the field of synthetic chemicals has had a profound influence upon development of synthetic gasolines. Thus the development of iso-octane was associated closely with that of secondary butyl alcohol. Other similarly close relationships may be expected as petroleum chemicals play an increasingly important part in the economics of the industry.

The manufacture of synthetic chemicals from petroleum and natural gas has been one of the major developments in the chemical industry during the past decade. As an example, Shell Chemical Company's production of ammonia has increased from 4500 tons in 1931 to 27,000 tons in 1939; of solvents from 90,000 lbs. 57,000,000 lbs. in the same period. A continually increasing variety of chemicals of exceptionally high purity is being made available at constantly decreasing cost, from cheap raw materials whose supply is stable, abundant, and remarkably adaptable.

Alcohols, ketones, and esters made from refinery gases that formerly were used only as furnace fuel are now well known to chemical markets. Many new products, now produced on laboratory and pilot-plant scale will join them in due course. Among these are unsaturated alcohols and chlorides, glycerol and its derivatives, and butadiene.

THE manufacture of synthetic chemicals from petroleum and from natural gas, closely related to it, is becoming a major American industry. Petroleum is well suited as a chemical raw material: it is cheap and abundant, and contains a wide variety of chemical types which, in themselves or after cracking to simpler compounds, may be converted to derivatives of many kinds. Several general reviews of this field recently have appeared‡[1,2,3,4]; the present paper will be concerned largely with developments in which Shell Chemical Co. has played some part. These developments are, however, typical of the petroleum chemical industry as a whole.

At the outset a word of explanation may be in order

*Shell Chemical Co., San Francisco, Calif.

‡Figures refer to bibliography.

†Presented before the American Petroleum Institute Nov. 13, in Chicago, under the title "Synthetic Chemicals from Petroleum."

regarding the relation of Shell Chemical Co. to its associates, Shell Oil Co. Inc., and Shell Development Co. By and large it may be said that Shell Chemical operates on raw materials which Shell Oil is in a position to furnish; and it uses processes and manufactures products which have been developed in the research laboratories and pilot plants of Shell Development. On behalf of Shell Chemical, the latter carries on extensive market research concurrently with its investigations of processing, to the end that applications may be found and markets developed for present and potential chemical products, and new products may be supplied to meet the expressed needs of industry.

In the synthetic-chemical field Shell Chemical Co. has been active both in the synthesis of alcohols, ketones, etc., from refinery cracked gases, and in the manufacture of ammonia and related products from natural gas and atmospheric nitrogen. Commercial operations were begun in 1930 with the production of secondary butyl alcohol from butylene at Martinez, Cal.; and, within a year, the synthesis of ammonia at Shell Point, near Pittsburg, Cal. Expanding operations necessitated extension of the Martinez plant in 1933 to manufacture tertiary butyl alcohol and methyl ethyl ketone, and soon thereafter at the same location a plant was built to regenerate spent alcohol acid to make it usable in manufacturing ammonium sulfate. In 1936 a large alcohol and ketone plant was built at Dominguez, near Los Angeles. This was later enlarged to produce acetates and higher-boiling ketones. In the first year of commercial operation about 4500 tons of ammonia and 90,000 lbs. of solvents were produced. In 1939, the corresponding figures were 27,000 tons, and 57,000,000 lbs. About half of the ammonia produced is converted into ammonium sulfate; and in this connection it may be noted that means have been found to use acid sludge from petroleum refining for this conversion, without impairing the quality of the ammonium sulfate produced.

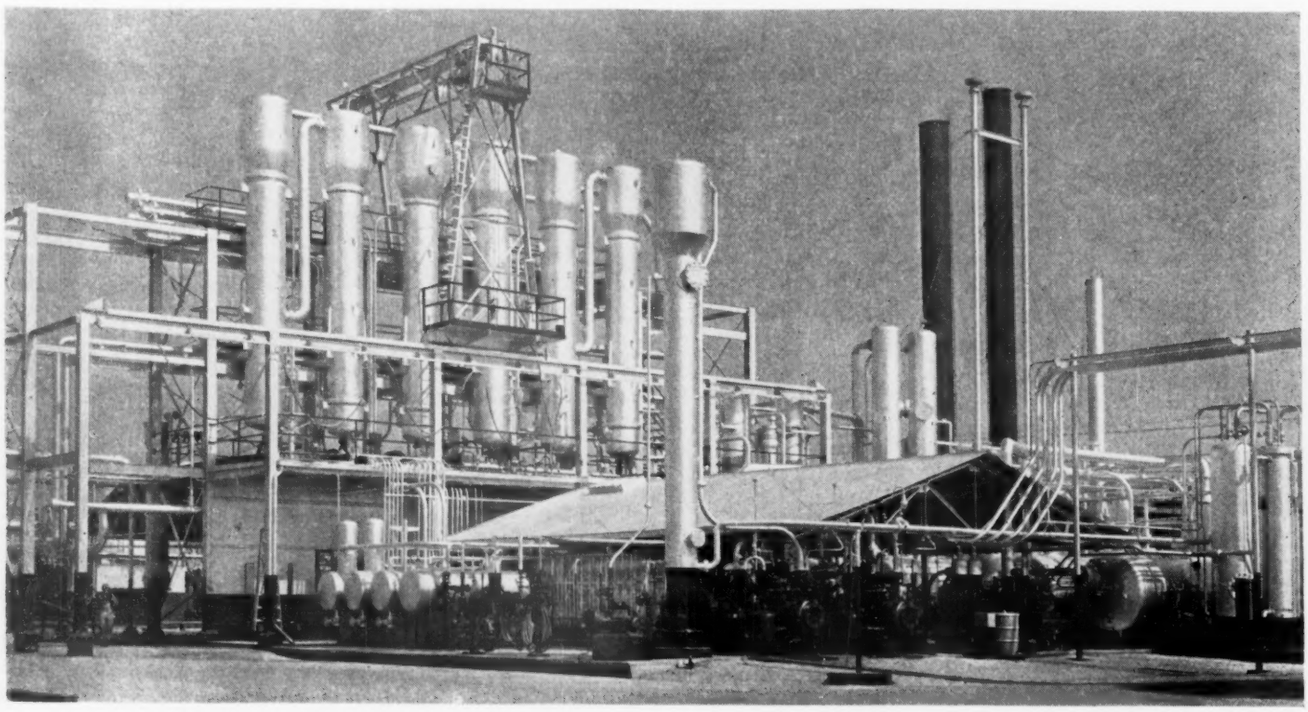
Manufacture of Ammonia

The manufacture of ammonia begins with the cracking of natural gas over a brick checker-work, at an average temperature of 2000° F., yielding a gas containing 70% of hydrogen, the rest being unconverted methane, with small amounts of nitrous oxide, carbon monoxide, carbon dioxide, benzene, ethylene, acetylene, and naphthalene. Most of the carbon content of the natural gas is converted to the solid form; it is separated from the crude hydrogen by washing with water and by electrical precipitation. Nitrous oxide is removed from the hydrogen by passage over iron oxide; naphthalene and benzene by washing with oil; carbon dioxide by washing with water and alkali; and light hydrocarbon impurities (methane, ethylene, and acetylene) by low-temperature fractionation, in the last stage of which liquefied atmospheric nitrogen is introduced to aid in the removal of carbon monoxide by fractionation, and to form a nitrogen-hydrogen mixture in the molecular proportions of ammonia. In the synthesis plant the last traces of carbon monoxide and oxygen are removed, and the synthesis is effected under high pressure, the ammonia emerging as a gas ready for liquefaction or conversion into ammonium sulfate.

THE principal application of ammonia is agricultural. When irrigation is practiced, farmers use the ammonia as a fertilizer in liquefied form, when it is carried into the soil in highly dilute solution with the water. In the form of ammonium sulfate it is used on land prior to irrigation, or on non-irrigated land. Ammonia is used also by large cities in the purification of water, in oil refineries as a neutralizing agent and corrosion preventative, and in cold-storage and ice-manufacturing equipment as a refrigerant. It is also a source of nitric acid for the manufacture of explosives, cellulose nitrate, etc.

The carbon which is left after the hydrogen has been removed from methane is processed further to meet the exacting requirements of the rubber industry. It has found wide acceptance as a soft carbon, such as is used in the compounding of rubber for hose, tubing, gaskets, and mechanical goods. That part of the carbon not suitable for this trade is made into briquettes which, because of their very low ash content and nearly zero sulfur content, have been found useful in metallurgy, more especially in steel production.

The production of alcohols, ketones, etc., from cracked petroleum gases has grown steadily in the past two decades. Thus, according to Tariff Commission reports, 37,500 gal. of *iso*propyl alcohol were made via the sulfation of propylene in 1922, 1,500,000 gal. in 1931, and 27,500,000 gal. in 1939.



Ammonia is one of the products produced at this gas reform plant near Pittsburg, Cal.

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Manufacture of Alcohol

The process used for the production of alcohols from olefins consists of:

a. Production of pure hydrocarbon fraction containing only the olefin and its corresponding paraffin.

b. Absorption of the olefin content in concentrated sulfuric acid to produce the alkyl hydrogen sulfates and dialkyl sulfates.

c. Separation of the products (b) from unreacted hydrocarbons.

d. Hydrolysis of the products (b) to either alcohols or ether in dilute sulfuric-acid solution.

e. Removal of alcohols and ethers from solutions (d) by distillation.

f. Subsequent purification of alcohols and ethers by fractionation.

In this way *iso*propyl alcohol and di*iso*propyl ether are made from propylene, secondary butyl alcohol from α- and β-butylenes and tertiary butyl alcohol from *iso*butylene.

Acetone is made from *iso*propyl alcohol, and methyl ethyl ketone from secondary butyl alcohol, by catalytic dehydrogenation and subsequent fractionation. These two alcohols also are converted to the corresponding acetates by continuous esterification processes especially developed for this purpose.

From acetone a further series of products is made: diacetone alcohol by catalytic condensation of acetone at low temperature, and subsequent fractionation; mesityl oxide by the catalytic dehydration of diacetone alcohol; and methyl *iso*butyl ketone by the catalytic hydrogenation of mesityl oxide.

Physical properties of these products, all made on commercial scale, are listed in Table 1.

The principal uses of the alcohols, ketones, and esters are as solvents and extractants in the manufacture of lacquers, varnishes, and allied products, synthetic resins, plastics, synthetic fibers, artificial leather, safety glass, photographic films, printing inks, cosmetics, medicinal preparations, explosives, etc., and also in the dewaxing of mineral oils and extraction of vegetable and animal materials.

The alcohols and ketones have found extensive use as base material for chemical synthesis to make products such as esters, chlorides, ethers, xanthates, substituted hydrocarbons, fruit essences, perfumes, dyestuffs, wetting agents, and synthetic resins. *Iso*propyl alcohol, because of its complete miscibility with water, is used extensively as a component of anti-freeze solutions for automobile radiators.

As a particular example of these olefin derivatives, let us consider methyl ethyl ketone—which until recently was available commercially only as a component of "light acetone oil," a by-product of the wood-distillation industry. This mixture was limited in quantity and of uncertain composition, and never found extensive industrial uses. Since the introduction of synthetic methyl ethyl ketone from petroleum, a pure product of uniformly high quality, it has been consumed in increasing quantities by a variety of industries. For instance, it is an excellent solvent for nitrocellulose, with good tolerance toward the other materials that are used in lacquer manufacture, and in many of its properties it excels the esters as a lacquer solvent. It is also an exceptionally good solvent for the highly polymerized vinyl-type resins. It is used as a paint remover, an extractant in various applications, and a dewaxing agent for mineral oil. It finds extensive use in the processing of cellulose-acetate plastics, in the synthesis of rubber chemicals, and in the manufacture of rotogravure and intaglio inks.

The Minor Products

Besides these major products, scores of others are in various stages of development in the research laboratories and pilot plants at Emeryville. Many of these are produced on semi-commercial scale; among them are several unsaturated chlorides and alcohols and their derivatives made from propylene and the butylenes via substitutive chlorination,[5] followed by hydrolysis, chlorhydrination, etc.[1,6] A number of these products, with physical properties are listed in Table 2. The first commercially practical synthesis of glycerol[7] was an outgrowth of these developments. This is now ready for full-scale application whenever economic conditions justify.

Also in the stage of semi-commercial development is butadiene, which is of growing interest in connection with the manufacture of synthetic rubber. Both Shell Chemical and Shell Development Co. have been active in this development for a number of years, and have for some time been supplying from the small-scale plant at Emeryville, Cal., several tons a week of butadiene to rubber manufacturers.

These are only illustrations of the possibilities of chemical products from petroleum; among the many develop-

TABLE 1

Properties of Pure Compounds

Compound and Chemical Formula	Molecular Weight	Specific Gravity (20/4 Deg. C.)	Boiling Point at 760 Mm. Mercury (Deg. C.)	Melting Point (Deg. C.)	Vapor Pressure at 20 Deg. C. (Millimeters of Mercury)	Flash Point (Closed Cup) (Deg. F)
Ketones						
Acetone: $CH_3CO.CH_3$	58.08	0.7898	56.1	—95.0	186.2	5
Methyl ethyl ketone: $CH_3CO.C_2H_5$	72.10	0.8047	79.6	—86.4	71.2	25
Methyl *iso*butyl ketone: $CH_3CO.CH_2CH(CH_3)_2$	100.16	0.8004	115.9	—83.5	15.2	60
Mesityl oxide: $CH_3CO.CH{:}C(CH_3)_2$	98.14	0.8546	129.5	—59	8.0	83
Diacetone alcohol: $CH_3CO.CH_2COH(CH_3)_2$	116.16	0.9384	166 (approximate)	—47	0.84	144 (open cup)
Esters						
*Iso*propyl acetate: $CH_3COO.CH(CH_3)_2$	102.13	0.8719	88.6	—73.4	....	39
Secondary butyl acetate: $CH_3COO.CH(CH_3).C_2H_5$	116.16	0.8711	112.4	.....	16.2	64
Alcohols						
*Iso*propyl alcohol: $CH_3CHOH.CH_3$	60.09	0.7848	82.3	—89.5	31.5	54
Secondary butyl alcohol: $CH_3CHOH.C_2H_5$	74.12	0.8065	99.5	—114.7	12.1	73
Tertiary butyl alcohol: $(CH_3)_3COH$	74.12	0.7791 (26 deg.)	82.4	25.6	57.3 (30 deg.)	48
Ethers						
*Iso*propyl ether: $(CH_3)_2CH.O.CH(CH_3)_2$	102.16	0.7238	68.4	—86.8	120.2	—6

Past, Present and Future are all considered in Kellogg-Built Units

Developments in refining are rapid. It no longer suffices to build a plant for today, it must be built with intelligent thought of the future. Those refiners who do the best job of planning today will be in the best position to take advantage of the developments of tomorrow.

The M. W. Kellogg Company is supplied with the essentials to assist in scientific refinery planning and construction. Its personnel comprises men of many years experience in research, design, construction and operation of refinery equipment in all parts of the world, with varying crudes, and for a wide range of products. In addition, through this organization the most advanced processes are made available to the refiner for converting available raw materials into a wide variety of profitable products.

For the solution of a present day refining problem or the formulation of plans for the future, consult The M. W. Kellogg Company.

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ments not touched upon is the wide variety of products from ethylene, such as ethyl alcohol, glycol and glycol ethers, and derivatives of acetylene, whose production from methane and other hydrocarbon gases has been shown to be feasible.

In the manufacture of chemicals from cracked petroleum gases the pioneers in the industry had attempted to react fairly complex mixtures of the various olefinic starting materials. This resulted in a multiplicity of main and side reaction products, with attendant difficultes of separation and purification. An important advance in manufacturing technique has been the separation of the mixture of hydrocarbons before reaction into small groups, such as C_3 (propane and propylene) or C_4 (butane and the butylenes), and the rigorous exclusion of harmful impurities such as sulfur compounds.

Not only have yields been improved by this means, but the resulting products themselves are produced eventually in high purity and of the unquestionable uniformity which is necessary for their application in many industries. For example, acetone used in the manufacture of artificial silk must be free from even the minutest amounts of active sulfur compounds, i.e., such as would corrode the metal spinnerets, whose constancy of diameter controls the denier of the silk fiber. When we first proposed to make acetone from petroleum gases, the head of a leading artificial-silk company stated that it would be impossible to think of meeting his requirements in this particular direction. In solving this problem the research laboratory first had to devise analytical methods applicable in the range of interest, i.e., of the order of 1 to 5 parts of sulfur in 10,000,000 parts of acetone. The technique of such measurements was so perfected that we now are able not only to measure a total sulfur impurity of less than 5 parts in 10,000,000, but also to say within a 10% error how much of that impurity is due to the presence of free sulfur, hydrogen sulfide, mercaptan, or other form of active sulfur.

By rigorous control of processing—including the purity of raw materials—guided throughout by such precise analytical procedures, acetone and other chemicals are produced regularly in a high state of purity. In fact, the high level of scientific standards and scientific control of manufacturing operations, which has been necessary in the petroleum chemical industry, has reflected to the benefit of the oil industry as a whole.

Refining Economics Affected

Moreover, important changes have been brought about in the fundamental economics of the oil industry, as a result of its entrance into the field of synthetic chemicals. Thus the guiding principle of Shell Chemical's first operations was to utilize refinery gases that otherwise would go to waste or, at most, be consumed as fuel. It would have been difficult to foresee the revolution in gasoline manufacture which was to come about as a result of one of the steps in secondary-butyl-alcohol synthesis—the step which consisted in removal of the *iso*butylene content of the feed by absorption in cold sulfuric acid, and recovery of the acid by heating, which polymerized the *iso*butylene to di*iso*butylene, the source of *iso*octane.

With the recognition of the possibilities of *iso*octane in aviation fuel came the development of the process as a refinery operation; and it soon became a question not of finding outlets for waste products, but of supplying enough raw materials for the needs in both chemical and synthetic-gasoline fields. This has led to the development, on the one hand, of the hot-acid polymerization process and the alkylation process, which utilize a greater proportion of the available hydrocarbon feeds; and, on the other hand, of processes for increasing the supplies of the key hydrocarbons.

Although prediction of future trends in the oil industry must be hazardous, there is no question but that chemical manufacture will play an increasingly important role. In some instances there actually may be a reversal of the original position, i.e., the refinery may be utilizing by-products of the chemical factory, and not the factory the by-products of the refinery. In any case, a close relationship may be expected as the operations of both expand into new fields.

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TABLE 2

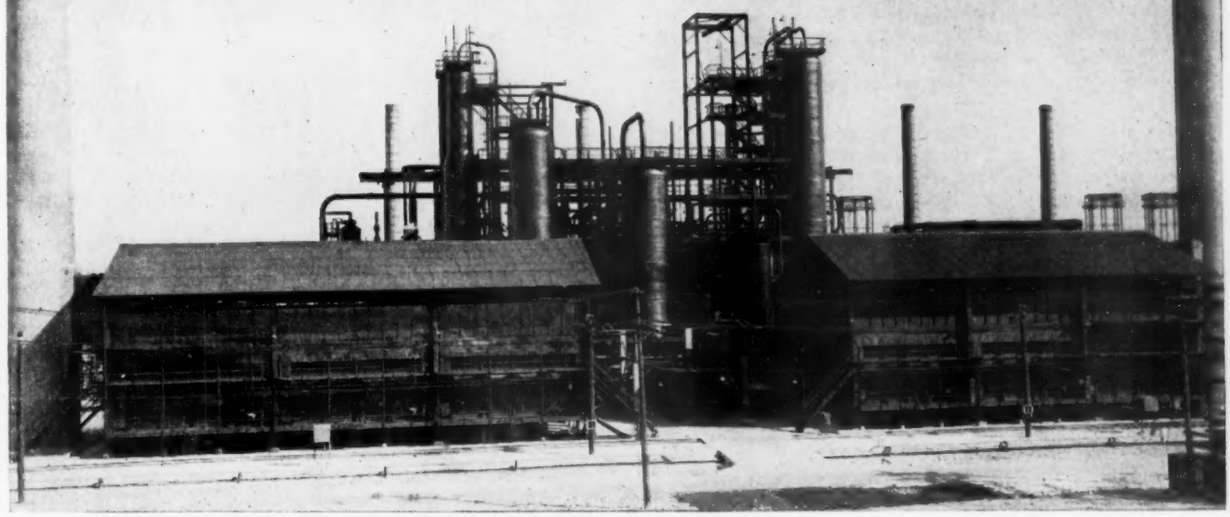
Derived Chemicals from Olefins by Chlorination

Name	Formula	Molecular Weight	Boiling Point (Deg. C.)	Specific Gravity (20/4 Deg. C.)	Flash Point[a] (Deg. F.)	Solubility in Water (Per Cent by Weight at 20 Deg. C.)
Allyl alcohol	$CH_2{=}CH{-}CH_2OH$	58.08	97	0.852	70	∞
Methallyl alcohol	$CH_2{=}C(CH_3){-}CH_2OH$	72.10	114	0.852	90	20
Allyl chloride	$CH_2{=}CH{-}CH_2Cl$	76.53	45	0.937	—25	<0.1
Methallyl chloride	$CH_2{=}C(CH_3){-}CH_2Cl$	90.56	72	0.926	10	<0.1
*Iso*crotyl chloride	$CH_3{-}C(CH_3){=}CHCl$	90.56	68	0.919	35	<0.1
1,2,3-trichloropropane	$CH_2Cl{-}CH(Cl){-}CH_2Cl$	147.45	156	1.391	170	<0.1
Diallyl ether	$CH_2{=}CH{-}CH_2{-}O{-}CH_2{-}CH{=}CH_2$	98.14	95	0.808	20	0.3
Dimethallyl ether	$CH_2{=}C(CH_3){-}CH_2{-}O{-}CH_2{-}C(CH_3){=}CH_2$	126.19	134	0.816	15	<0.1
Glycerol α-monochlorohydrin	$CH_2OH{-}CH(OH){-}CH_2Cl$	110.55	213	1.320	280	∞
Glycerol dichlorohydrin	$CH_2Cl{-}CH(Cl){-}CH_2OH$	128.99	182	1.362	200	13
Epichlorohydrin	$CH_2Cl{-}CH(\overset{O}{\triangle}){-}CH_2$	92.53	117	1.181	90	6

[a]ASTM open cup.

THE POLYFORM and GAS REVERSION PROCESSES

for high octane gasoline from oil stocks, butanes and propanes



One of a number of High Octane Gasoline Crude Combination Polyform Units built by Lummus during the last 5 years. These plants give regular 2,000 hour runs without difficulty from coke formation.

Under the patents of the Gulf Oil Corporation and Phillips Petroleum Company, Lummus designs, builds and licenses Polyform and Gas Reversion units which include the conversion of propanes and butanes with cracking stocks into high octane gasoline. These plants are characterized by excellent yields. Eleven of these units, with a total throughput of 61,000 barrels per day of oil, naphtha, outside propanes and butanes, are in commercial operation with established practice of over 5 years. Two more, charging 18,000 barrels per day of naphtha, outside propanes and butanes are now under construction. Complete information upon request.

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Gasoline Additive Improves Stability, Cuts Corrosion

A CHEMICAL found to be effective in improving leaded and unleaded gasoline quality and stability, was described in the annual meeting of the American Petroleum Institute in Chicago, Nov. 13, by H. V. Rees, W. S. Quimby, and J. C. D. Oosterhout, The Texas Co. The chemical is lecithin, a phosphatide obtained from soybeans. It was said to have little effect on initial or dark storage color, but markedly reduces decolorization as well as haze and deposit formation when exposed to sunlight.

Its use was said to result in decreased corrosion of storage-tank bottoms and of galvanized drums, particularly those containing highly leaded aviation gasolines in which the formation of zinc-oxide deposits often requires filtration prior to consumption. Reduced aluminum corrosion in aviation gasoline tanks due to moisture condensation also was found. Required dosages range from 1 lb. to 15 lbs. per 1000 bbl.

The use of lecithin in gasoline resulted from attempts to prevent deterioration of gasoline in filling station pump bowls. Test data indicated that inhibiting action depended upon the nature of the gasoline, the effect being much less pronounced on straight-run gasoline than on cracked gasoline. The chemical was found to have no effect on initial octane number or TEL susceptibility. However, up to 12 octane numbers were lost on certain samples which formed heavy cloud and deposits. This reduction in octane number appears to be related to the amount of cloud formed, it was pointed out, and for similar type gasolines appears to be proportional to the amount of TEL present in the original samples.

The copper dish gum test of the base gasoline before sunlight exposure was not affected materially by lecithin at values below 20 to 30 mg. per 100 ml. At high copper dish gum values, above 70 to 100 mg. per 100 ml., a reduction generally was noted. After sunlight exposure, however, the base gasolines containing cracked components showed considerably increased copper-dish-gum values, but the action of lecithin was such as to minimize the detrimental effect of the exposure.

The sunlight stability of leaded gasolines was noted to be related to their sulfur content. It was found that doctor sweetening and copper sweetening both aided sun stability and the sweetened gasolines were further benefited by lecithin. During the course of investigation, it was noted that certain gasolines required an auxiliary agent with lecithin to effect the desired stability. It was found that a combination of strong gum inhibitors with commercial phenol and lecithin greatly improved the sunlight stability of leaded gasolines from the standpoint of cloud formation and color change.

After several years of full-scale refinery production of gasolines containing lecithin, examinations of engines using lecithin-treated gasolines did not reveal any deleterious effects, the authors stated, and it appears to be entirely harmless.

Corrosion Prevented

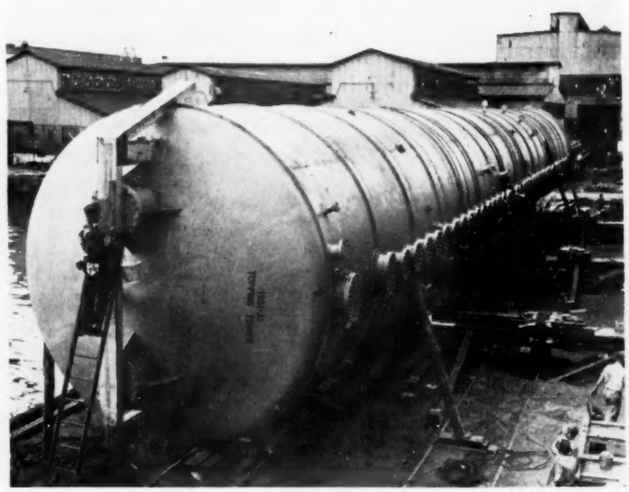
Another function of lecithin is the prevention of corrosion of iron and galvanized iron containers by gasoline, both leaded and unleaded. In tests in which small strips of carefully cleaned iron and galvanized iron were placed in stoppered glass bottles for a year with gasoline containing lecithin, it was found that all strips were free of corrosion when no water was present. In the presence of water and unleaded gasoline, all strips were corroded considerably, particularly that part of the strip immersed in water. The corrosive effect of the water was more pronounced in leaded gasoline. The alkalinity of the water appeared to reduce the corrosion of leaded gasoline, as greatest corrosion was found in the presence of distilled water.

These tests were followed by actual storage in drums, such as are used for aviation gasoline. Lecithin was said to be extremely effective in eliminating the formation of zinc oxide in the absence of water, and in materially reducing it when water was present. Dosages of 5-15 lb./1000 bbl. were used. In addition, corrosion of aluminum fuel-tank bottoms by TEL can be largely eliminated, it was said.

The authors pointed out that each refiner and each gasoline will require a different amount of lecithin to effect the desired results, depending upon the susceptibility of the gasoline to lecithin and upon the desired storage stability. With dosages ranging from 1 to 15 lb. per 1000 bbl. of gasoline, the cost of lecithin stabilization ranges from 0.04 to 0.56 cents per barrel, they concluded.

The lecithin was described as a fat-like yellow or brownish substance of plastic consistency occurring in all living cells. It forms colloidal solutions, and has found various other applications such as an interface modifier or emulsifier in the leather, textile, pigment, and food industries. Until 1928 it was derived wholly from animal sources, chiefly egg yolk, and was rather costly. Today it is solvent extracted from soy beans with hexane.

Largest Tower to Move by Water



The largest piece of refining equipment ever manufactured in a fabricating plant and delivered in one piece by water transportation arrived recently after a 170-mile journey behind a tug at the refinery of Tide Water Associated Oil Co., Bayonne, N. J. The tower, 144 feet long, 18 feet in diameter, and weighing 640,000 pounds, will become a part of a Houdry catalytic process. Workmen are shown here putting the finishing touches on the tower before rolling it off the dock of Sun Shipbuilding Co., Chester, Pa.

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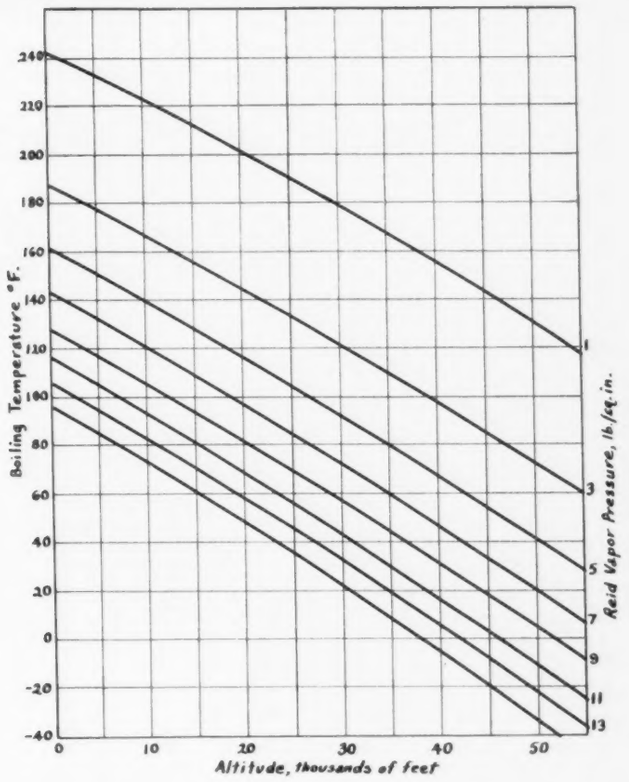
Seek Vapor Lock Reduction In Aviation Fuel Systems



An aviation fuel of 7 lb. Reid vapor pressure leaving the ground at 100° F. would start to boil at 20,000 feet

CONSIDERABLE progress was made during the past year in the investigation of vapor lock in airplane fuel systems, Dr. O. C. Bridgeman, U. S. Bureau of Standards, reported to the National Aircraft Production meeting of the Society of Automotive Engineers in Los Angeles, Oct. 29 to Nov. 2.

Summarizing the situation from the fuel side of the problem, it was pointed out that "decrease in vapor pressure would permit operation at higher altitudes without vapor lock, but would make engine starting more difficult, would increase explosion hazards and would reduce availability of high octane fuel. From every standpoint except vapor lock, increase in fuel vapor pressure is desirable. This means that all other means of controlling vapor lock should be exhausted before consideration is given to lowering of fuel vapor pressure."

"Since pressure drop is the basic consideration in fuel system design from the vapor lock standpoint, the experimental work of the CFR Committee on Aviation Vapor Lock Investigation during the past year has been concentrated on this phase of the problem." The present program on pressure drops in component parts of fuel systems is near completion. Additional work of a related nature is planned, however, and this will be accompanied or followed by development of fuel system fittings and accessories of low pressure drop and assistance in the development of more satisfactory fuel pump installations.

Dr. Bridgeman discussed two other proposed methods of controlling vapor pressure. One was by use of pressure in the fuel tank, a method which he believes is worthy of serious consideration. The other was by cooling the fuel. Some compromise methods involving fuel system design were also discussed briefly.

The accompanying chart shows the temperatures at which boiling in a fuel tank will start at various altitudes with typical fuels. A 7 lb. Reid fuel leaving the ground at 100° F. would start to boil at 20,000 feet, assuming no change in temperature during the climb, the chart shows. Vapor lock, however, does not generally occur until somewhat higher altitudes are reached than those at which boiling occurs.

A fuel of 7 lb. vapor pressure was considered comparatively safe since, under most conditions of handling, storage and airplane operation, the mixture of air and gasoline vapor in the tank is too rich to be explosive. If a gasoline of lower vapor pressure is used as a means of avoiding vapor lock, more hazard is introduced from an explosion standpoint.

IN this connection, Dr. Bridgeman pointed out that "it is of interest to note that the range of temperature throughout which an explosive mixture exists in the tank increases as the vapor pressure of the fuel is lowered. Thus for 7-lb. fuel this temperature range is about 50° F. while for a 'safety fuel' the range is about 70° F. Further, the work of the committee has shown that the flash point of a fuel is considerably higher than the lean explosive limit temperature (lowest temperature for explosion), the difference corresponding to about 12° F. for an average aviation gasoline and about 16° F. for a 'safety fuel'. Thus with 'safety fuels' having a flash point of 100° F., the mixture in the tank may be explosive at any temperature above 84° F. on the ground, and the explosive limit temperatures will decrease rapidly with altitude."

Still more serious criticism was made of fuels of very low vapor pressure. They would require a special engine starting fuel and require solid-injection systems. Decrease of vapor pressure in a fuel also decreases the availability of gasoline of high octane number by both present and future production methods. Dr. Bridgeman concluded that "from the availability standpoint, increase in fuel vapor pressure is desirable."

Bearing Failures Accelerated By Metallic Soap Detergents

CLEVELAND, Nov. 9.—Attention has been focused on the failure of copper-lead bearings in heavy-duty service during the past year, Mr. H. R. Wolf, General Motors Corp., stated at the National Fuels and Lubricants meeting of the Society of Automotive Engineers in Tulsa, Nov. 7 and 8. There were two types of failure, one involving loss of lead due to the corrosive effect of the lubricant and the other a mechanical failure due to fatigue.

Corrosion and fatigue are greatly accelerated by an increase in bearing pressure, Mr. Wolf said, and consequently tests made in full-size multi-cylinder engines more closely approximate service conditions than miniature single-cylinder engine tests or laboratory bearing corrosion tests.

Loss of lead may be caused by the solvent action of acidic products formed on oxidation of the base oil which, in turn, is accelerated by the catalytic effect of metallic soaps used as detergents, he said. Also the loss of lead may be caused by the action of metallic soaps under pressure in the heavily loaded bearing areas. This was said to be a relatively new phase of the bearing corrosion problem. Metallic soaps appear to decompose under the conditions existing in the high pressure bearing areas yielding free acids. Metallic compounds, other than metallic soaps, when used in detergents do not cause the bearing corrosion, it was found. Failures due to fatigue could be distinguished readily from those due to loss of lead.

Refiners must consider four factors related to heavy-duty service conditions, Mr. Wolf said. These are crude source, refining process, oxidation inhibitor, and detergent or suspension agent. The importance of each of these factors was said to depend upon the specific purpose for which the lubricant is intended and the actual field operating conditions under which the lubricant is to be used.

No one set of service conditions can give a complete evaluation of a crankcase oil and no one set of dynamometer test conditions can correlate with service he pointed out. However, experience in the field has shown that crankcase lubricants not passing successfully General Motors' 500-hour test on the dynamometer will not perform satisfactorily under the more severe service conditions of many diesel engines.

Engine Dynamometer Operating Conditions

	Chevrolet	GM "71" Diesel (3, 4, or 6 cyl. engine)
Speed	3150 rpm. (60 mph.)	2000 rpm.
Load	30 to 35 hp.	27 hp./cyl.
Piston head temperature	500°F.	.....
Crankcase oil temperature	280°F.	230°F.
Jacket water outlet temperature	200°F.	180°F.
Jacket water inlet temperature	.....	12-15 lower than outlet
Fuel temperature	room	120°F.
Intake air temperature	room	105°F.
Oil consumption	1 qt./500 miles	max. .06 lb./hr./cyl.
Exhaust back pressure	nominal	6" Hg.
Length of test	4000 miles (67 hrs.)	500 hrs.

Discussing the solution of the heavy-duty problem, Mr. Wolf said the stress on crankcase oil under heavy-duty operating conditions can be lowered by reducing crankcase oil temperature. However, this was considered only a temporary solution since the designer immediately takes advantage of this reduction in temperature by increasing specific power output.

Bearing manufacturers were said to be making considerable progress in the development of corrosion resistant bearings also but the only permanent and satisfactory solution of the problem was believed to be the further development of heavy-duty lubricants, containing suitable inhibitors or anti-oxidants and detergent compounds.

Reviews Diesel Lube Development

Ulric B. Bray reviewed the development of modern lubricants for modern diesels. In discussing detergency he said it is not to be confused with solvent action wherein undesirable crankcase contaminants are dissolved because it is a colloidal phenomena wherein the contaminants are held in suspension through some kind of peptizing action or other form of colloidal protection.

While the most important function of detergency is probably to prevent ring sticking, he said, improved cleanliness of the engine throughout is obviously desirable. Since practical dosage of detergents is capable of carrying only so much "dirt" in suspension, the detergent oils must be replaced either continuously or periodically.

Three types of detergents were named—the oil soluble soaps or salts of true organic acids, organic metal compounds which are not true soaps but which represent a combination of a metal constituent and an organic compound having acidic or salt forming properties, and complex organic compounds containing no metal. The first was said to be the most powerful, the last the least. Petroleum technologists, he said, are inclined to draw from all three classes instead of relying upon any one class.

There are now oxidation inhibitors in commercial use which make such a tremendous improvement in oxidation resistance of certain oils that the compounded oils with and without the inhibitors fall into entirely different categories when actually run in diesel engines, Mr. Bray said. He added that prevention of bearing corrosion is also prevented when oxidation is prevented. A full degree of protection against bearing corrosion was considered to include oxidation inhibition, corrosion inhibition, and reserve alkalinity.

Martin B. Chittick, The Pure Oil Co., discussed the rationalization of lubricating greases as an attempt to push aside some of the mystery that has always surrounded this class of lubricants and to present some of the problems involved. He described the accomplishment of the National Lubricating Grease Institute in classifying greases by consistencies and added that pertinent data are needed on the effect of structure on the service performance of greases, and on why certain structures are more desirable under some applications than others. He also called attention to the generally recognized need for a standard test for stability, pointing out that since various researches definitely indicate that a test is feasible, further research work should result in development of such a test. Mr. Chittick included with his paper a bibliography of 438 references to lubricating grease manufacture, technology, and service experience and tests.

Fuels Savings Worth Change To Diesel Bus Operation

817.1

A fuel saving of approximately 30% has been realized by the introduction of diesels last year on Burlington Transportation Co.'s Chicago-California runs, W. A. Taussig, of that company, told the National Fuels and Lubricants meeting of the Society of Automotive Engineers Nov. 7 at Tulsa. While there were "some exceedingly discouraging experiences," such as a road failure every 12,000 miles of operation at first, which made these runs practically a 3000-mile laboratory for experimentation, difficulties were overcome by the latter part of 1939 to the extent that fuel savings could not be ignored.

A full fleet of 21 two-cycle diesel powered buses were placed in service, the manufacturer accepting responsibility for satisfactory operation. The plunge was made all at once in order to take advantage of tankcar prices of diesel fuel. Since then, 17 more of these buses have been added to the fleet. Mr. Taussig said that with the hardest part of pioneering over, more and more operators will avail themselves of the diesel fuel economies.

One of the major problems in diesel bus operation is to obtain suitable fuel, Mr. Taussig said. A considerable lack of uniformity in the fuels obtainable in different parts of the country was shown by the fact, for example, that cetane numbers vary from 37 to 60 or better. There is obviously plenty of room for improvement in our diesel fuels to eliminate smoking exhausts and soot deposits in the engine, he said, and added that "if the diesel engine is to survive as a prime mover in long distance bus service, there must not be any appreciable increase in the price of fuel. If fuel savings were to be materially lessened

INDEX TO ADVERTISERS

Refining Technology Section

(*See also page 47*)

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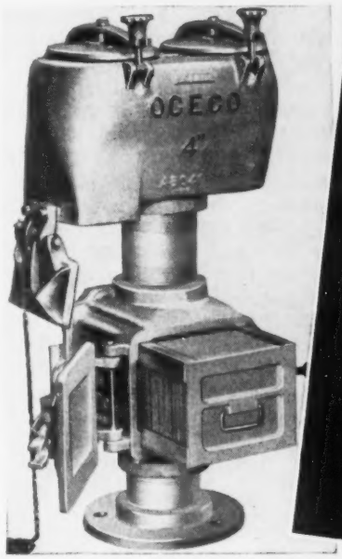

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through increased fuel prices, there would remain little inducement for the operator to select diesel engines."

Mr. Taussig said the fuel and lubricants division of the S.A.E. can materially assist the bus operator by properly preparing sample specifications for fuels suitable for automotive two-stroke cycle diesel engines, and he added that, no doubt, several sets would be necessary to cover various operating conditions.

Lubricating oil experience was summarized by the following statements: "1. A pure unadulterated mineral oil does not produce satisfactory results regardless of its stability.

"2. Any oil that breaks down in service into corrosive compounds must be treated with neutralizing corrosion inhibitors to protect copper-lead engine bearings.

"3. Most, if not all, lubricating oils require the addition of an oxidation inhibitor.

"4. The addition of a detergent is necessary to scour varnish forming compounds from piston walls and from cylinder liners.

"We apparently are not certain whether lubricating oil or fuel is responsible for varnish formation. At any rate we seem unable to prevent it. As long as this condition exists, it must be removed as effectively as possible."

Speaking of the advantages of the diesel powered buses, Mr. Taussig said "it has been definitely noted that the ability of the diesel to maintain relatively high torque throughout its speed range is reflected in less effort on the part of the driver to maintain fast schedules without increasing vehicle top speed. Smoothness of operation is another advantage. The six cylinder two-stroke cycle diesel produces less vibration in the bus than does the six cylinder four-cycle gasoline engine of approximately the same power output."

A large part of the early difficulties were corrected by improvements in engine design and Mr. Taussig named 15 of the most important changes that were made to the engine.

Geophysical Prospecting for Oil

The outgrowth of a course of lectures on geophysical prospecting for oil by L. L. Nettleton, Gulf Research and Development Co., is a 444-page book on this subject designed chiefly for students in petroleum geology and petroleum engineering or for the layman. The book is not intended by the author to be for the geophysical specialist although it may serve him as a convenient reference.

The author points out that a voluminous periodical literature on geophysics as applied to prospecting for oil has grown up but that no single source gives a connected presentation of the principles and practice. It is primarily to supply such a source that this work was published.

The book is divided into five parts which deal with four general methods and geophysical interpretation. The latter makes up the final chapter of the book but it is recommended that readers turn to this chapter before proceeding very far in the book and read it through and then read it again after finishing the first four parts.

Although, as the author states, "mathematics has not been avoided or suppressed," the book can be read by the layman who does not plan to become a geophysicist and a good deal of interest will be aroused in how the geophysicist works, what he works with, and why his probing of the earth's surface and noting variations in gravity, magnetism, sound transmission, or electric currents have any relation to the presence of oil. The book is a text-book primarily, however, and students who have had a college course in physics will find material which will take them a long way toward the field of geophysics as applied to oil prospecting.

The book is well illustrated with diagrams of apparatus, pictures of prospecting equipment, and other illustrative diagrams to clarify the mathematics. One of the features of the book is the bibliography of material on the various subjects after each section sub-divided by years of publication.

The book is available at $5 from Book Department, NATIONAL PETROLEUM NEWS, Cleveland, O.

New Patents

Compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, NW, Washington, D. C., from whom copies may be obtained at rate of 25c each. State number of patent and name of inventor when ordering.

September 10, 1940

Recovery of liquid from hydrocarbon gases—O. L. Roberts, assignor to Atlantic Refining Co. Filed Oct. 31, 1939. No. 2,213,996.

Purification of oil soluble sulphonate—F. M. Archibald, assignor to Standard Oil Development Co. Filed Jan. 29, 1938. No. 2,214,037.

Solvent refining of mineral oil—R. E. Manley and B. Y. McCarty, assignors to Texas Co. Filed June 14, 1934. No. 2,214,282.

Process for recovery of liquids—B. S. Greensfelder and L. R. Goldsmith, assignors to Shell Development Co. Filed Aug. 29, 1938. No. 2,214,368.

Multistage catalytic conversion of hydrocarbons—Gustav Egloff and C. L. Thomas, assignors to Universal Oil Products Co. Filed Jan. 30, 1939. No. 2,214,455.

Treatment of hydrocarbons—Vladimir Ipatieff and R. E. Schaad, assignors to Universal Oil Products Co. Filed Apr. 30, 1937. No. 2,214,463.

Alkylation of paraffin hydrocarbons — Louis Schmerling and Herman Pines, assignors to Universal Oil Products Co. Filed Mar. 25, 1939. No. 2,214,481.

Method and apparatus for clay treating (decolorizing)—A. S. Hagan, Butler, Pa. Filed Dec. 6, 1938. No. 2,214,671.

Process for recovery of desirable constituents from gas—P. M. Raigorodsky, assignor to Petroleum Engineernig, Inc. Filed Dec. 10, 1938. No. 2,214,678.

Pipe still—G. W. Watts, assignor to Standard Oil Co. (Ind.) Filed Feb. 2, 1928. No. 2,214,711.

Lubricant—B. H. Lincoln and Alfred Hendriksen, assignors to Lubri-Zol Development Corp. Filed Sept. 16, 1938. No. 2,213,988.

Diesel fuel—Eugene Lieber, and Pharis Miller, assignors to Standard Oil Development Co. Filed July 14, 1938. No. 2,214,059.

Extreme pressure lubricant—F. R. Moser, Amsterdam, Netherlands, and M. C. Tuyn, Singapore, assignors to Shell Development Co. Filed Nov. 22, 1937. No. 2,214,379.

Process for treating mineral oils (stabilizing)—M. R. Cannon and K. A. Varteressian, State College, Pa. Filed Mar. 2, 1937. No. 2,214,401. K. A. Varteressian, Nos. 2,214,443-4.

Cutting oil—B. A. Dombrow, assignor to National Oil Products Co. Filed May 21, 1938. No. 2,214,634.

September 17, 1940

Treatment of hydrocarbon gases — H. V. Atwill, assignor to Process Management Co. Filed Oct. 31, 1934. No. 2,215,062.

Process for production of valuable hydrocarbon products by extraction of solid carbonaceous materials—Mathias Pier and Ernst Donath, Germany, assignors to Standard-I. G. Co. Filed July 21, 1937. No. 2,215,190.

Hydrogenation of coal—B. S. Biggs, and J. F. Weiler, assignors to Carnegie Institute of Technology. Filed July 6, 1937. No. 2,215,206.

Oil refining—Jack Robinson, assignor to Standard Oil Co. (Ind.) Filed Mar. 10, 1932. No. 2,215,362.

Treatment of motor fuel—F. W. McCurry, Wichita. Filed Nov. 21, 1938. No. 2,214,749.

Engine fuel—B. H. Lincoln, assignor to Lubri-Zol Development Corp. Filed Feb. 5, 1938. No. 2,214,768.

Synthetic resinous material—David Lipkin, assignor to Atlantic Refining Co. Filed Aug. 5, 1937. No. 2,214,769.

Processes and reagents for resolving (petroleum) emulsions—T. B. Wayne, Houston. Filed July 29, 1938. Nos. 2,214,783 and 2,214,784.

Lubricating oil compositions, constituents thereof, and methods of manufacturing same—T. L. Cantrell and J. S. Stockhardt, assignors to Gulf Oil Corp. Filed June 25, 1938. No. 2,214,875.

Manufacture of asphalts—V. L. Shipp, A. H. Boenau, and J. W. Ramsay, assignors to Socony-Vacuum Oil Co. Filed Mar. 21, 1940. No. 2,215,074.

Catalyst regeneration, and process of reactivating synthetic oxide gel catalysts—Alexis Voorhies, Jr., assignor to Standard Oil Development Co. Filed Apr. 5 and Dec. 10, 1938. Nos. 2,215,304 and 2,215,305.

St. Hill Leaves Petreco

Resignation of T. N. St. Hill, vice president of Petrolite Corp. in charge of Petroleum Rectifying Co. division, is announced as of Oct. 31, 1940. Mr. St. Hill, for some time a director of Tea Garden Products Co., San Francisco, will devote full time to this firm as its president. He had been with Petreco 11 years and will still remain a director of Petrolite.

Licenses Recycling Process

The Texas Co. is purchasing equipment for a distillate or recycling plant at Berwick, near Morgan City, La. The plant is scheduled for early completion. This is the second recycling plant under way for Louisiana. The first is located in the Cotton Valley field in north Louisiana. The process was licensed recently from Distillate Engineering and Processes Co.

Domestic Gasoline Demand Increases 6% in September

N. P. N. News Bureau

WASHINGTON, Nov. 9.—Domestic demand for motor fuel in September was 52,297,000 bbls., or 6% higher than a year ago, Bureau of Mines reports. Exports of motor fuel were higher than generally expected, but the total of 1,907,000 bbls. was less than half what it was in September, 1939.

Favorable demand situation, however, was nullified, report said, by increased runs to stills so that the reduction in gasoline stocks was below expectations. Inventories of finished and unfinished gasoline declined from 83,701,000 bbls. the first of the month to 81,907,000 bbls. Sept. 30, the latter being about 11,000,000 bbls. above the level of last year.

Domestic demand for gas oil and distillate fuel was 7% above a year ago, but the domestic demand for residual fuel oil was 5% lower.

Yields of gasoline and distillates were 43.9% and 13.7%, respectively, the same as in August. A year ago, gasoline yield was 1.2% higher, but the distillate yield was 1.4%.

Decline in crude-oil production of several months duration was halted in September, when the daily average rose to 3,644,600 bbls., or nearly 80,000 bbls. above the August average, Bureau stated.

The material gain in production, however, was more than offset by heavier consumption, particularly runs to stills, so that there was a moderate reduction in crude-oil stocks, the first in nearly a year.

Texas was largely responsible for the gain in the national output as its daily average rose over 100,000 bbls. to 1,318,300 bbls. Gain in Texas was general throughout the state, East Texas being the only district decreasing.

Most of the other important producing states decreased, but daily production in both Kansas and Louisiana rose about 10,000 bbls. above the August averages. Illinois production continued to slump, but the decrease in the daily average—from 389,500 bbls. in August to 364,200 bbls. in September—was much less than in the 2 previous months.

Bureau of Labor Statistics price index for petroleum products in September, 1940, was 48.9% compared with 49.2% in August and 53.3 in September, 1939, Mines Bureau noted.

Diversion of Gasoline Tax Receipts Outlawed by Amendments in 3 States

N. P. N. News Bureau

NEW YORK, Nov. 11. — A victory in the fight against diversion of gasoline tax receipts and revenues from other automotive taxes was won in the Nov. 5 elections, when unofficial returns showed voters in three states, two states by large majorities, approved constitutional amendments restricting the use of such revenues to highway purposes. Another state, Louisiana, voted to reduce the amount of the gasoline tax diverted by 1c per gal.

The 3 states which ratified anti-diversion amendments this year are Idaho, Nevada and South Carolina. In all 3 states the amendments had been passed by legislatures. Constitutional amendments prohibiting diversion have now been adopted by 11 states.

In Oklahoma, an initiative petition backed by county commissioners, which would have increased the counties' share of the gasoline tax revenue by reducing the state's share from 70% to 39%, was defeated at the polls. If this proposal had passed, the state's income from the gasoline tax would have been reduced from approximately $11,500,000 to $5,500,000, based on 1939 tax receipts. Opponents of the measure held that its adoption would have stopped the building of state highways.

Two amendments, also proposed by initiative petition, were defeated in Missouri. One of them would have increased the gasoline tax 1c per gal. The other would have fixed motor vehicle license fees at present rates.

Socony Advances Fuels 2 Cents In East

NEW YORK, Nov. 11. — A 0.2c per gal. increase in its prices for Mobilheat (Nos. 2 and 3 fuel oils) throughout New England and upper New York state was announced by Socony Vacuum Oil Co. last week. In Maine, New Hampshire and Rhode Island, the change was effective Nov. 4; in Vermont, Connecticut and upper New York state, on Nov. 6. All methods of delivery were affected by this increase, and in upper New York, area covered by the change will extend as far west as Watertown, Rome and Norwich, a Socony official said.

Later in the week, Socony announced a further 0.2c per gal. increase in its prices for Mobilheat, and a 0.2c per gal. increase in its prices for kerosine, in upper New York state, both effective Nov. 7.

In announcing the later change, which covers all methods of delivery, a Socony official said, "The advance will affect both products (Mobilheat and kerosine) in the Elmira, Buffalo, and Rochester district areas, while in the Syracuse district area, the change will affect only Mobilheat, and in the Jamestown area, only kerosine will be advanced."

Ickes Remains Uncertain on 'Oil Conservation'

N. P. N. News Bureau

WASHINGTON, Nov. 7.—Interior Secretary Ickes told his press conference today he does not know whether he will push his "oil conservation plans" in the closing days of the present session or wait until Congress meets in January.

"I'll have to think that over," he said, declaring there ought to be some "legal authorization for a more effective co-operation between the federal government and the states on the prevention of waste and all that sort of thing."

All-Purpose Lube Proposed In Federal Specifications

WASHINGTON, Nov. 11.—A universal gear lubricant specification (F.S. VV-L-761) has been proposed as a federal specification. This lubricant "is intended for use in all gears, including hypoids, steering columns and fluid lubricated universal joints of automotive equipment, and in all heavy duty industrial type enclosed gear units."

Three classes of lubricant are defined, all of which consist of a blend of 90% by weight of mineral oil and 10% by weight of either of two specified additives.

Class 1 is for continued use below 0° F. in automotive equipment and for general use in industrial type enclosed gear units requiring a lubricant of low viscosity.

Class 2 is for general use in automotive equipment at all other atmospheric temperatures and in industrial type enclosed gear units requiring a lubricant of medium viscosity.

Class 3 is for general use in industrial type enclosed gear units requiring a lubricant of high viscosity and in automotive equipment where special conditions require a more viscous lubricant than Class 2. Following are the detail requirements:

Class	Viscosity, S. U. sec. at 210°F. Min.	Max.	Channel Test Min. temp., °F.
1	55	65	-20
2	80	90	0
3	160	220	40

Additives permitted are (1) a mixture containing 70-80% by weight of chlorinated paraffin wax (40% chlorine), the remainder being dibenzyl disulfide and (2) chlornaphtha xanthate (30-35% chlorine).

The mineral oil constituent of the universal gear lubricant must meet the following Navy Department specifications:

Class	Additive (a)	Additive (b)
1	3050	3065
2	3080	3100
3	5190	5190

2 Alcorn Officials Die Within 8 Days

Two officials of the Alcorn Combustion Co., Philadelphia, died within a period of eight days: James S. Alcorn, president, Nov. 5 at Wynnewood, Pa., and Arthur E. Nash, vice-president and treasurer, in Philadelphia, Oct. 29.

Mr. Alcorn was a graduate of the University of Pennsylvania Law School, and for several years was associated with the law firm of Simpson and Brown. Leaving law practice, he became interested in heating equipment and for past 17 years has been president of Alcorn Combustion Co. He was also director of Faber Engineering Co. Among clubs of which Mr. Alcorn was a member, were Board of St. David's Golf Club, Orpheus Club and for 7 years, he was member of Philadelphia Leslie Club Team.

Mr. Nash graduated from Massachusetts Institute of Technology in 1902, and for many years worked with DuPont Co. as a research chemist, later becoming vice-president of Philadelphia Rubber Co. He resigned this position to become vice-president and treasurer of Alcorn Combustion Co., when it was organized in 1923. Mr. Nash is the holder of many patents and was author of several articles on heating.

1ST IN POWER... 1ST IN ECONOMY *now...*

1ST *in* DRIVER COMFORT

GMC Trucks are a revelation in comfort and easy handling. Controls are placed just right! Instruments are grouped for split-second visibility! Cabs have generous leg room and *buoyantly cushioned* seats. And now *all GMCs*, including the ½-ton models, have been made "as easy to steer as your own car."

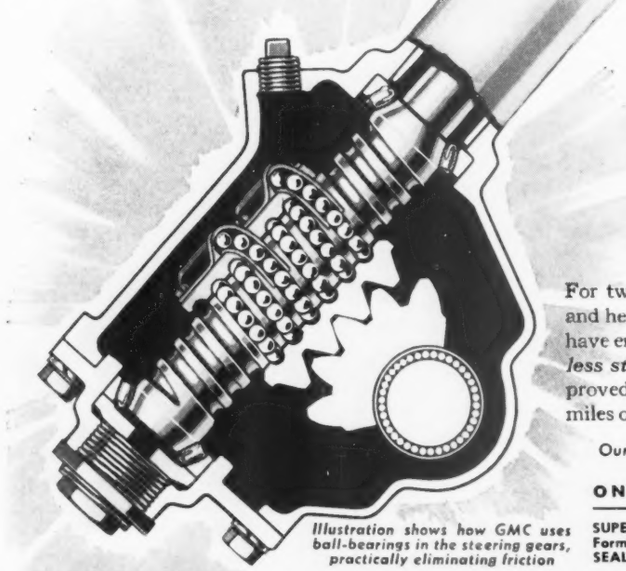

Illustration shows how GMC uses ball-bearings in the steering gears, practically eliminating friction

Ball-Bearing Steering

For two years, drivers of medium and heavy General Motors Trucks have enjoyed this exclusive *effortless steering* feature. They have proved its reliability in millions of miles of hard service. They say it's the greatest driving comfort and truck safety development of the age. Add the *greater pulling ability* of GMC's Super-Duty Engines and you have *driver appeal* that simply can't be matched!

Our own YMAC Time Payment Plan assures you of lowest available rates

ONLY GMC TRUCKS OFFER ALL THIS EXTRA VALUE

SUPER-DUTY Engines with gas-saving TURBO-TOP Pistons • RIDER-EASE Cabs with Form-Fitting Seats and QUICK-VISION Instrument Panels • BALL-BEARING Steering SEALED-BEAM Headlamps with separate parking lamps • TOP-SIZE factory-built Bodies

THE TRUCK OF VALUE

GMC TRUCKS

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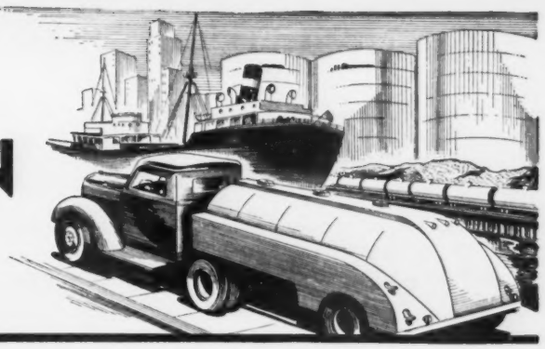
OIL TRANSPORTATION



Tanker Rates Move Upward As Boat Demand Increases

N. P. N. News Bureau

NEW YORK, Nov. 9.—With heavy demand and scarcity of tonnage sending coastwise tanker rates upward at a much faster pace than last year, both pro and con arguments are heard here on the possibility that rates may exceed the levels reached last January when charterers paid as much as 72c per bbl. in the open market for movement of No. 2 fuel from the Gulf to North of Hatteras.

Several factors enter into the picture when considering the increased demand for tonnage, it is said. Activity at industrial plants along the East Coast has increased considerably, creating a greater demand for heavy fuel oil.

At the same time, an early spurt of winter weather has caused eastern oil companies to desire additional fuel oil, according to reports. Another factor which has increased demand for tonnage is that few time-charters for consecutive voyages were taken at the start of the heating oil season this year, according to reports here.

Early in the year, when fuel oil marketers usually execute charters for consecutive voyages with fixed minimum and maximum rates, coastwise tanker rates stood at 20c for gasoline, 18c for 30 gravity or lighter crude. Uncertainty of conditions abroad, however, caused owners to ask a minimum of 25c, basis of gasoline, for this type of business it is said.

Time Charterers Pay Higher

Some tankers were taken on this basis, and charterers taking these boats paid more than the market rate until early October, when the gasoline rate advanced to 25c. Maximum rates in these charters, based on average of last 3 open fixtures before loading, are said to range as high as 64c, basis of gasoline, while the majority are between 35c and 45c.

Last paid Gulf-N. Hatteras rate for gasoline was 48c; kerosine, 51c; and No. 2 fuel, 54c; having advanced approximately 24c since Oct. 1. Last year at this time, "clean" rates stood at 36c for gasoline, 37c for kerosine, and 38c for No. 2 fuel, having advanced only 1c per bbl. during the previous month. "Dirty" coastwise rates this year are also higher than last year at this time. Fixture of a boat at 40c for 30 gravity or lighter crude, 45.5c for 10-19.9 gravity fuel, was reported early this week, compared with rates of 35c for light crude, and 37c for 10-19.9 gravity fuel last year.

Circus Rates Cited In Train Load Case

N. P. N. News Bureau

TULSA, Nov. 11.—The Interstate Commerce Commission has been requested by Tidewater Associated Oil Co. to reconsider action of ICC Commissioner Splawn and Examiner Stiles in excluding an exhibit pertaining to rates on circus trains from the record taken on multiple-car petroleum rail rates recently.

In discussing the exhibit with the commission, J. R. Lewallen of Tulsa, Tidewater traffic manager, claimed that it was prepared to show that railroads recognize the lower cost of handling shipments as the volume increases and is admissible evidence.

It "refutes conclusively the position taken by rail carrier defendants that they can handle single carload shipments cheaper than shipments moving in quantity lots," he told the commission in his petition.

The exhibit under fire contained a statement showing resulting rail rates on gasoline and refined products computed on the rate basis now in effect on circus trains, using the same quantity cargoes as provided in the circus train charge. A comparison of rates based on the circus train scale for 25-car shipments with present single-car rates on petroleum, Group 3 to several pipeline terminal points, as take from the exhibit, is shown below in cents per hundredweight:

Group 3 to:	Present 1-car rate	25-car lot rate based on circus-train rate
Kansas City, Mo.	27c	8.15c
Des Moines, Ia.	36c	15.15c
Chicago	40c	22.47c
Superior, Neb.	28c	11.91c
Terre Haute, Ind.	46c	19.78c

ICC Calendar On Oil Trucking

DECISIONS

Keenan Bros., Inc. (MF ICC No. 6). Schedule of new minimum rates on gasoline from Pennsylvania to Ohio and West Virginia ordered suspended until June 4, 1941, unless otherwise ordered by Commission and no change made in such rates during said period unless authorized by special permission of the Commission.

Joe D. Hughes, Inc., (MC 93318). Findings in prior report (19 MCC 540) modified to authorize operations as a common carrier of oil field equipment and supplies, between points and places in Texas and oil field locations, and of pipe, pipeline material, machinery, and equipment incidental to and used in connection with the construction of gas, gasoline, and oil pipe lines, between points in Texas and pipe line locations, over irregular routes.

B. W. Belyea (MC 37375, sub. 1). Issuance of certificate approved, upon compliance by applicant with certain conditions, to operate as a common carrier of petroleum products in bulk from San Diego, Calif., to boundary between United States and Mexico, over regular routes.

Giles F. Vaughan, doing business as Vaughan's Transfer, Union, S. C., (MC 50824, sub. 2). Permit denied to operate as a contract carrier of petroleum and its products from Augusta, Brunswick, Savannah, and Port Wentworth, Ga., and from Wilmington, N. C., to points in South Carolina, over irregular routes.

HEARINGS

James A. Hannah, doing business as James A. Hannah Truck Service, Chicago, Ill., (MC 47346, sub. 1) Nov. 13, Chicago, on application to extend operations as a contract carrier of petroleum products in bulk, in the States of Illinois, Indiana, Michigan, Iowa, and Wisconsin, over irregular routes.

C. H. McDougald, doing business as McDougald Transfer Co., Cheraw, South Carolina, (MC 60749, sub. 5) Nov. 26, Charlotte, on application for certificate authorizing extension of common carrier operations in transporting petroleum products between Philadelphia, Pa., and points located in South Carolina, over irregular routes.

Truck Driver Wins Wage-Hour Lawsuit For 'Double Damage'

WASHINGTON, Nov. 6. — A case just decided in the Western Tennessee Federal District Court is seen by Wage-Hour Division lawyers as lending support to their position that the Wage-Hour Act covers all employes, including truck drivers, of bulk plants receiving petroleum products from other states, even though all such products are resold within the state where the bulk plant is located.

Case involves truck driver delivering for a concern wholesaling flour and lumber obtaining its products from other states, who has been awarded double damages under the law. Truck driver was chiefly employed to make deliveries to points within the state, although making occasional deliveries to another state.

New Lube Rate Protested

WASHINGTON, Nov. 8. Standard Oil Co. of La., today protested to the Interstate Commerce Commission that a newly-published rate of 8.8c per hundredweight on lubricating oil in carload lots between Princeton, La., and Pearson, Ark., constitutes an opening wedge for the establishment of unduly low rates on lubricating oil throughout the Southwest.

Company, in its complaint filed with the ICC, asserts the Princeton-Pearson rate is unjustly low and points out that truck-compelled rates are not usually accorded lubricating oil because of its high value and low volume in comparison with gasoline.

NEW YORK, Nov.11. — A 15c per bbl. increase in posted prices for marine diesel oil, ships' bunkers, exclusive of lightering, at several points along the Atlantic coast was announced by principal suppliers the past week. Posted price is $1.85 per bbl. at New York, Boston, Providence, Norfolk and Baltimore; $1.95 at Portland, Me.

Heating Oil Demand is Above Normal in the East

Heating oil demand in New England and along the middle and northern Atlantic seaboard continued well above normal through October.

In the Middle West, the return of almost summer weather made heating oil demand less than normal in October, while in September demand had been above normal at many points in that section.

Along the Pacific Coast, demand was less than normal in October, as it had been in September.

Tables below give oil marketers' heating oil requirements, shown in Degree Days, from outside temperature deficiencies below 65 F. (For complete explanation of use of Degree Days in calculating heating oil requirements, see NPN, Sept. 11, p. 25)

Figures in the tables are totals by months of Degree Days, as reported by U. S. Weather Bureau district offices.

Columns headed "% Above or Below Normal Needs" give the percentages by which the actual number of Degree Days in October, and for the current heating season to Nov. 1, exceed or are less than the normal number of Degree Days for the same periods. This is a gauge to heating oil consumption for the current season, as compared with a normal season.

Actual Degree Days for the same periods in the preceding 1939-40 heating season are also compared with normal Degree Days to give oil marketers a means for comparing their heating oil business this season with that in the same periods last season.

The tables also give, for October and for September-October, the percentage of the actual number of Degree Days to those of the entire normal heating season, thus indicating to the oil company the proportion of a normal season's heating oil requirements used.

October Heating Oil Requirements, in Degree Days

	October, 1940			October, 1939		Season to Nov. 1		
	Oct. Normal DDs	Actual Oct. 1940 DDs	% Above or Below Normal Needs	Actual Oct. 1939 DDs	% Above or Below Normal Oct. '39	% Normal Season's Needs Used In Oct. '40	% Normal Season's Needs Used In Oct. '39	Total DDs In Normal Season
NEW ENGLAND								
Portland, Me.	443	528	+19	472	+ 7	+7.8	+7	6814
Burlington, Vt.	490	635	+30	542	+11	+8.5	+7.2	7486
Boston	353	450	+27	352	— 0	+7.5	+5.9	6022
Providence, R. I.	352	454	+29	359	+ 2	+8	+6.3	5689
Hartford, Conn.	366	525	+43	387	+ 6	+7.7	+6.4	6010
Rochester	403	551	+37	413	+ 2	+8.3	+6.2	6620
MIDDLE ATLANTIC								
New York City	270	371	+37	293	+ 8	+7	+6	5290
Albany	405	593	+46	504	+24	+9.1	+7.7	6516
Rochester	403	....	....	....	....	.....	.....	....
Buffalo	407	494	+21	404	— 1	+7.4	+6	6723
Trenton, N. J.	300	408	+36	313	+ 4	+7.9	+6	5190
Philadelphia	224	335	+50	264	+18	+7	+5.5	4792
SOUTH ATLANTIC								
Baltimore	243	296	+22	227	— 7	+6.4	+5	4628
Washington	252	300	+19	255	+ 1	+6.5	+5.5	4620
Richmond, Va.	167	237	+42	214	+28	+6.2	+5.6	3820
NORTH CENTRAL								
Cleveland	354	348	— 2	314	—11	+5.6	+5.1	6144
Chicago	363	245	—33	324	—11	+3.8	+5	6378
Detroit	387	407	+ 5	399	+ 3	+6.3	+6.1	6454
Milwaukee	437	298	—32	387	—11	+4.1	+5.4	7117
Minneapolis	487	347	—29	542	+11	+4.4	+6.9	7895
St. Louis	238	82	—66	183	—23	+1.8	+4	4658
Des Moines, Ia.	361	175	—52	333	— 8	+2.8	+5.3	6329
Omaha	344	145	—58	309	—10	+2.3	+5	6229
Kansas City	252	86	—66	191	—24	+1.7	+3.8	5006
PACIFIC COAST								
Seattle, Wash.	343	246	—28	338	— 1	+5.7	+7.8	4317
Portland, Oreg.	336	209	—38	264	—21	+4.8	+6.1	4367
San Francisco	120	116	— 3	119	— 1	+4.9	+5	2382

Current Season's Heating Oil Requirements to Nov. 1, in Degree Days

	Sept.-Oct. Normal DDs	Actual Sept.-Oct. 1940 DDs	% Above or Below Normal	Actual Sept.-Oct. 1939 DDs	% Above or Below Normal	% Normal Season's Needs Used In Sept.-Oct. '40	% Normal Season's Needs Used In Sept.-Oct. '39	% Normal Season Required In Normal Sept.-Oct.
NEW ENGLAND								
Portland, Me.	563	701	+25	642	+14	+10.3	+ 9.4	+ 8.3
Burlington, Vt.	630	850	+28	780	+24	+11.4	+10.4	+ 8.4
Boston	446	561	+26	441	— 1	+ 9.3	+ 7.3	+ 7.4
Providence, R. I.	434	560	+30	443	+ 2	+ 9.8	+ 7.8	+ 7.6
Hartford, Conn.	470	674	+43	483	+ 3	+11.2	+ 8	+ 7.8
Rochester	493	687	+39	530	+ 8	+10.4	+ 8	+ 7.5
MIDDLE ATLANTIC								
New York City	282	435	+54	317	+12	+ 8.2	+ 6	+ 5.3
Albany	517	766	+48	666	+29	+11.8	+10.2	+ 7.9
Rochester	....	....	....	....	....	.....	.....	....
Buffalo	488	631	+29	542	+11	+ 9.4	+ 8.1	+ 7.36
Trenton, N. J.	310	494	+59	352	+14	+ 9.5	+ 6.8	+ 6.0
Philadelphia	227	388	+71	280	+23	+ 8.1	+ 5.9	+ 4.8
SOUTH ATLANTIC								
Baltimore	281	345	+23	240	—15	+ 7.5	+ 5.2	+ 6.0
Washington	295	361	+22	268	— 9	+ 7.8	+ 5.8	+ 6.4
Richmond, Va.	167	299	+79	217	+30	+ 7.8	+ 5.7	+ 4.4
NORTH CENTRAL								
Cleveland	401	467	+16	379	— 5	+ 7.6	+ 6.1	+ 6.5
Chicago	457	351	—23	376	—18	+ 5.5	+ 6	+ 7.2
Detroit	445	538	+21	507	+14	+ 8.3	+ 7.9	+ 6.9
Milwaukee	512	432	—16	481	— 6	+ 6	+ 6.8	+ 7.2
Minneapolis	646	463	—28	691	+ 7	+ 5.9	+ 8.9	+ 8.2
St. Louis	280	124	—56	199	—29	+ 2.7	+ 4.3	+ 6.0
Des Moines, Ia.	461	256	—44	410	—11	+ 4	+ 6.5	+ 7.3
Omaha	435	217	—50	376	—14	+ 3.5	+ 6	+ 7.0
Kansas City	305	144	—53	226	—26	+ 2.9	+ 4.5	+ 6.1
PACIFIC COAST								
Seattle, Wash.	496	306	—38	467	— 6	+ 7.1	+10.8	+11.5
Portland, Oreg.	436	257	—41	323	—26	+ 5.9	+ 7.4	+10.0
San Francisco	230	152	—34	200	—13	+ 6.3	+ 8.4	+10.0

Proper Maintenance Improves Mileage, Cuts Octane Requirements, A.P.I. Told

FACTORS other than gasoline which hinder the good performance and economy of today's automobile engines, came in for discussion at the 21st annual American Petroleum Institute meeting in Chicago, Nov. 11 to 15.

What these factors are that contribute to poor performance and economy, even with the best fuels, are important to the oil marketer.

If, because of improper timing adjustment, worn distributor mechanism, bad spark plugs, or other unfavorable conditions, the car does not perform up to expectations, the motorist may blame the gasoline. Few motorists recognize the part played by mechanical condition of the engine and its accessories, in operating performance.

This problem becomes of increasing importance in the modern high-output engines designed to give greater performance and economy, but more sensitive to improper adjustment and poor mechanical condition.

The trend toward higher compression ratios, most pronounced on some 1941 cars, makes good mechanical condition and maintenance particularly necessary.

Correction of some of the troubles which contribute to poor engine performance and economy and affect the octane requirements, fall under the regular service work offered through the stations of most oil marketers. Others require special skill and equipment.

In one paper presented to the API and published in full in this issue, two automotive engineers of Phillips Petroleum Co. discuss in detail various items of motor maintenance, which influence fuel-quality requirements for "trouble-free" operation of today's cars.

The authors divide these items into 2 logical classifications: those which affect volatility characteristics of the fuel, and those which act to determine anti-knock requirements.

From a series of road tests on 18 cars, which investigated effects of carbon removal on octane requirements, it was found the average car required a 71.4 octane number gasoline before corrective measures and adjustments, and 62.7 octane fuel after the corrections.

Commenting on this, the authors said: "The magnitude of the effect of carbon deposits on octane requirements appears to warrant more attention on the part of car owners to applying the maintenance necessary to decrease the rapid buildup of deposits."

On 6 cars the octane number requirements were studied after performing each of the following 5 maintenance services:

1—Adjusting the basis spark timing to the manufacturer's specifications.

2—Cleaning the air filter.

3—Adjusting the distributor to the manufacturer's specifications.

4—Removing combustion-chamber deposits.

5—Grinding the valves.

The average octane number requirement of the 6 cars before these maintenance adjustments was 75.5, after the adjustments 66.

At the same meeting, two Shell Oil Co. engineers discussed the relation between engine performance and ignition timing maintenance. This paper is also presented in full in this issue.

Because the attainment of peak performance in a modern car requires a delicate combination of spark timing and compression ratio, the authors point out that the continued maintenance of the proper timing mechanism adjustment is necessary if best performance is to be expected.

Accumulated information is declared to indicate that timing mechanisms of a small percentage of cars are allowed to become advanced in service, so that octane requirements are increased enough to cause knocking with present-day fuels, with no improvement in engine performance.

An even larger percentage of cars has been found to operate with the spark timing retarded excessively, causing definite reduction in performance.

Although the importance of correct timing has become common knowledge through the cooperative studies of various groups, the authors of this paper say: "It can be likened to the weather, concerning which Mark Twain once said that nobody ever does anything about it. Greater care in maintenance of correct timing not only would ensure improved performance with present-day fuels—it also would reduce the number of cases in which detonation is obtained with today's fuels."

Trimble-Bottenberg Paper

Following is full text of paper to be presented at A.P.I. annual meeting by H. M. Trimble and K. C. Bottenberg, of Phillips Petroleum Co., Bartlesville, Okla.:

Items of motor maintenance exerting an influence on fuel-quality requirements would appear to fall logically into two main classes, viz., those items which contribute to place limitations on the volatility characteristics of fuels, and those which contribute to determine required anti-knock characteristics. It is almost impossible definitely to classify some items of maintenance in this fashion, because they may have indirect effects on both volatility and anti-knock requirements. It is the purpose of this paper briefly to enumerate and describe some of the more important maintenance variables from a fuel-supplier's viewpoint.

Effects of such variables, of course, can be eliminated only by periodic checkups on the part of the car owner. Unfortunately, because of the general dependability of our present-day automobiles—i.e., they frequently will continue to run regardless of how much they are abused—an owner seldom thinks of a checkup unless his car refuses to run at all. Then, when the checkup is made, it usually is limited to the particular gadget that is responsible for the immediate trouble, all others being completely ignored.

If the car owner only knew and thoroughly appreciated that periodic checkups were intended to be made and that such inspections would result in material economies in operation, many of the problems of supplying him with real service, of guaranteeing him continued trouble-free operation throughout the life of his car, would disappear.

II. A LISTING OF MAINTENANCE VARIABLES

Variables affecting volatility requirements: Most of the maintenance items which bear upon the handling of fuels up to the inlet valves of the motor proper would fall into this classification. The chief items are those connected with the fuel pump, the carburetor, and the manifold.

Fuel pumps: Difficulties with modern fuel pump, that affect volatility requirements, are usually a matter of proper adjustment of the discharge pressure.

Carburetors: Carburetors present a more complex problem, due to the wide variety of designs and the numerous adjustments. The carburetor details present in the maintenance picture include proper jet-size and metering-pin adjustments, proper adjustments of float level, idling, and automatic choke. The wide variety of designs makes it impossible to deal with each of these items individually. Suffice it to say that individually and collectively, they contribute to determine the volatility characteristics of gasoline for trouble-free operation.

Manifolds: Manifold heat controls are the disturbing feature in this con-

LEGEND

Octane-Number Requirement

1. Original; 2. After adjusting basic spark timing to standard; 3. After cleaning carburetor air filter; 4. After adjusting distributor to manufacturer's specifications; 5. After removal of combustion-chamber deposits; 6. After grinding valves

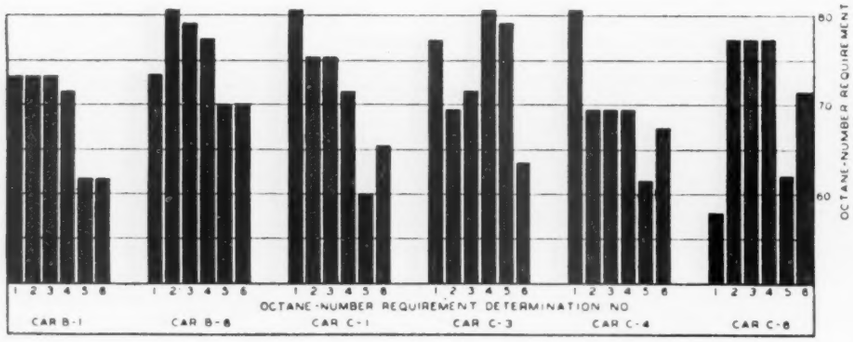


Fig. 1—The Octane-Number Requirements of Six Cars After Performing Each of the Indicated Items of Maintenance

nection. In many instances units are found to be entirely inoperative or in poor adjustment after a period of service.

Other items: In addition to the items enumerated we also may include all of those other items which tend to cause high motor and under-hood temperatures, i.e., cooling-system deposits, excessively retarded spark, etc

Variables affecting anti-knock requirements: The chief items which affect octane requirements are items dealing with the motor proper, i.e., condition of inlet and exhaust valves, condition of piston rings and cylinders, spark-plug condition, ignition timing, automatic spark-advance adjustments and, finally, combustion-chamber deposits. Other items, such as too rich automatic choke settings and cooling-system deposits, also contribute to a degree, either by giving directly higher temperatures in the combustion chamber or by speeding up the accumulation of troublesome deposits.

III. MAINTENANCE AS AFFECTING OCTANE REQUIREMENTS

Because the advertised differences between gasolines offered at any one filling station are concentrated on octane number, other characteristics being ignored, it is natural when the customer makes his purchases that he should think only of octane number and of things which bear upon his use of various octane-number gasolines. For this reason we are limiting our discussion from this point on to factors directly affecting the octane requirements of cars.

A study was made by the writers, in which an attempt was made to determine the magnitude of a few of the more important maintenance factors on anti-knock requirement. The study involved a total of eighteen 1938- and 1939-model cars in the popular big three low-price field. On 6 of these 18 cars the maintenance items studied included the following in the order named: 1, the effect of adjusting the basic spark timing to the manufacturer's specifications; 2, the effect of cleaning the air filter; 3, the effect of adjusting the distributor to the manufacturer's specifications; 4, the effect of removing combustion-chamber deposits; and 5, the effect of grinding valves. On 4 of the remaining 12 cars most of these items of maintenance were investigated, and on 8 of them only the effect of carbon removal was determined.

Each of the cars first was checked carefully to determine octane requirements as received, in order to permit later comparisons as to the magnitude of the effects traceable to the various corrective steps. All maintenance operations and adjustments were handled by skilled garage service men.

Octane requirements were determined by the 1939 API Automotive Survey Committee road-test procedure. This procedure consists essentially of driving 30 to 50 miles at approximately 50 mph. to stabilize motor temperatures, then driving through the same cycles of operations involved in actually making the tests to obtain equilibrium temperatures, and finally making exploratory runs with various blends of A, C, and F reference fuels until the blend resulting in "trace knock" is found. The octane requirement assigned to the car in this test procedure is the ASTM octane number of the reference-fuel blend which results in "trace knock."

The data obtained for the six cars on which all of the indicated maintenance factors were studied are depicted graphically in Fig. 1. These data also are shown in tabular form in Table 1, along with the four other cars on which most of the maintenance operations were performed. Inasmuch as these data indicated that the item of combustion-chamber deposits was of major importance, further obser-

TABLE 1

Effect of Various Engine-Maintenance Adjustments on Octane-Number Requirements of Several Cars

					Change in Octane-Number Requirement Produced by:								
Car	Model (Year)	Standard Basic Spark Timing (Degrees)	Basic Spark Timing "As Received" (Degrees)	Octane-Number Requirement "As Received"	Adjusting Basic Spark Timing to Standard	Cleaning Carburetor Air Filter	Adjusting Distributor to Manufacturer's Specifications	Removal of Combustion-Chamber Deposits	Grinding Valves	Final Octane-Number Requirement after Indicated Adjustments	Net Cumulative Change in Octane-Number Requirement	Miles Since Last Carbon Removal	Car Mileage
A-5	1938	4 BTC	8 BTC	79.1	— 1.9	....		—13.6	....	63.6	—15.5	28,500	28,500
B-1	1939	5 BTC	4.5 BTC	73.3	0.0	0.0	—1.9	— 9.7	0.0	61.7	—11.6	31,452	31,452
B-2	1939	5 BTC	3 BTC	77.2	*	0.0	+1.9*	— 7.7	+ 1.9	73.3	— 3.9	6,668	35,400
B-5	1938	5 BTC	5 BTC	63.6	....	+2.0	0.0	—11.7†	0.0	53.9	— 9.7	9,155	50,140
B-6	1938	5 BTC	2 BTC	73.3	+ 7.4	—1.6	— 1.9	— 7.4	0.0	69.8	— 3.5	23,514	36,612
C-1	1939	TDC	3 BTC	80.7	— 5.5	0.0	—3.8	—11.6	+ 5.8	65.6	—15.1	25,679	25,679
C-2	1939	TDC	6 BTC	91.5	—12.4	....		—13.5	+ 3.8	69.4	—22.1	23,891	23,891
C-3	1939	TDC	6 BTC	77.2	— 7.8	+2.0	+9.3	— 1.6	—15.5	63.6	—13.6	18,357	18,357
C-4	1938	4 ATC	5 BTC	80.7	—11.2	0.0	0.0	— 7.8	+ 5.8	67.5	—13.2	26,788	26,788
C-6	1938	4 ATC	11 ATC	57.8	+19.4	0.0	0.0	—15.5	+ 9.7	71.4	+13.6	39,234	39,234
Average								—10.0		66.0		23,324	31,605

Note: Positive signs denote an octane-number-requirement increase. Negative signs denote an octane-number-requirement decrease.
*Adjustment of basic spark timing and distributor to manufacturer's specifications done in one step.
†New cylinder head installed.

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vations were made on the effect of this variable in eight additional cars. The effect of carbon removal on all 18 cars is shown in Table 2. Compression pressures were obtained for some of these cars, both before and after grinding valves, with results as shown in Table 3.

IV. DISCUSSION

Only one of the five items of maintenance investigated showed consistent results in the direction of lower octane requrements. This item was the removal of combustion-chamber deposits, and the effect ranged anywhere from 1.6 to 15.5 octane numbers. The data show no definite relationship between octane-requirement decrease and miles driven since last carbon removal. Doubtless this variation is caused to a great extent by such factors as the type service to which the car is subjected, the amount of oil entering the combustion chamber through faulty rings, etc. However, it would appear from these tests that possibly about 15 or 16 octane-number decrease is the maximum that might be expected, whereas a decrease of 8 to 10 octane numbers in the requirement more nearly might represent an average case. It is also apparent that a 13- to 15-octane number increase may occur in as few as 15,000 miles.

The only thing which can be said of the remaining four items of maintenance investigated is that they have definite effects on octane requirements, although the effect is not always in the same direction. The final average difference between the octane requirements of all the cars—as received, and after adjustments and corrective measures had been applied—was 8.7 octane numbers. Excepting the cars on which only the effect of carbon removal was studied, a decrease in requirement from an initial average of 75.5 octane number to a final average of 66.0 octane number, or 9.5 units, was secured.

In view of this great difference in octane requirements, which appears to be largely a matter of combustion-chamber deposits, one naturally wonders about the factors which might contribute to a rapid building up of deposits. Excessive chocking due to badly adjusted or inoperative automatic chokes, and the condition of rings and pistons, undoubtedly play an important part in the rapid building up of combustion-chamber deposits, and as a consequence deserve some consideration on the customer's part.

These limited observations would appear to be convincing proof that maintenance items can play an important part in determining the qualities needed in gasoline for trouble-free operation. It is believed that car owners well could afford to consider more seriously the matter of periodic checkups, instead of postponing servicing until the "old bus" refuses to run.

TABLE 2

Effect of Carbon Removal on Octane-Number Requirement

Car	Model (Year)	Octane-Number Requirement		Decrease in Octane-Number Requirement	Miles Since Last Carbon Removal
		Before	After		
A-1	1939	57.8	52.0	5.8	3,163
A-2	1939	61.7	48.1	13.6	24,124
A-3	1939	69.4	61.7	7.7	37,232
A-4	1938	61.7	59.8	1.9	36,956
A-5	1938	77.2	63.6	13.6	28,500
A-6	1938	65.6	59.8	5.8	45,322
B-1	1939	71.4	61.7	9.7	31,452
B-2	1939	79.1	71.4	7.7	6,668
B-3	1939	67.5	61.7	5.8	28,722
B-4	1938	75.2	61.7	13.5	15,906
B-5	1938	65.6	53.9*	11.7	9,155
B-6	1938	80.7	73.3	7.4	23,514
C-1	1939	71.4	59.8	11.6	25,679
C-2	1939	79.1	65.6	13.5	23,891
C-3	1939	80.7	79.1	1.6	18,357
C-4	1938	77.2	69.4	7.8	26,788
C-5	1938	71.4	63.6	7.8	4,915
C-6	1938	77.2	61.7	15.5	39,234
Average of all cars		71.7	62.7	9.0	23,865
Average of 1939 cars		70.9	62.3	8.6	22,145
Average of 1938 cars		72.5	63.1	9.4	25,588

*New cylinder head installed.

Engine Performance as Influenced By Ignition-Timing Maintenance

By R. J. Greenshields and L. E. Hebl*, for Presentation at 21st Annual Meeting of American Petroleum Institute at Chicago*

The importance of spark timing and its relationship to engine performance has been recognized by both the automotive and petroleum industries during the past several years. With a gradual increase in compression ratios of engines designed to meet the demand for more power and greater economy, the time of igniting the charge has become more and more critical in order to obtain optimum performance. The increase in octane requirement accompanying these changes in design likewise has become more critical. Not only has the octane-requirement level been raised, but the variation from car to car has become much more serious. This is true because the refiners necessarily must supply the demand with usually two, and not more than three, octane-number grades of fuel. An unnecessary waste of high-octane gasoline is evident if only a few cars of high-octane requirement control the general octane-number level of gasolines being marketed.

In numerous papers presented to group sessions[1a] such as this one, investigators have shown the relationships found by them to exist between power, economy, octane requirement, and spark timing. It is not our object to try to improve or amend the relationships found in the individual laboratories by presenting data obtained in the course of our own research projects, but rather to attempt to piece together the data that are already available. There is available a considerable mass of data on this subject, which has been gathered from all parts of the country. The American Petroleum Institute, for example, has conducted cooperative surveys for a number of years to obtain a representative picture of the octane requirements of cars, and particularly since 1937 has it directed the survey towards a study of the major factors influenc-

*Shell Oil Co., Inc., Wood River, Ill.

TABLE 3

Effect of Valve Grinding on Compression Pressures

Car	Model (Year)		Compression Pressure (Pounds Per Square Inch) Cylinder Number					
			1	2	3	4	5	6
B-2	1939	Before	127	131	135	130	135	132
		After	128	133	134	135	136	138
B-5	1938		126	125	127	124	125	123
C-1	1939	Before	90	102	97	106	106	95
		After	97	97	97	95	105	100
C-2	1939	Before	105	105	100	105	95	100
		After	105	105	110	110	105	108
C-4	1938	Before	102	96	65	86	98	90
		After	103	105	98	110	104	98
C-6	1938	Before	120	120	108	115	107	126
		After	115	115	102	110	110	113

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ing the wide spread in octane. From these data, submitted by many laboratories, it is possible to obtain indisputable evidence of the influence of various factors on engine performance in service, and a good cross-sectional view of the octane-requirement picture. It is the purpose of this paper to discuss these data from the surveys of the past several years, and to present as simply as possible relationships showing the influence of spark timing on engine power, economy, and octane requirement.

Power Should be Obtained with Distribution Set as Recommended

In order to understand the significance of the data obtained by the survey group on spark timing and its relation to power, it is necessary to consider the problem of design involved. The high compression ratios of today's engines are justified solely for obtaining good economy. A marked increase in engine power cannot be obtained by relatively great increases in compression ratios. The increase in torque with increase in compression ratio is shown for a single-cylinder engine in Fig. 1. The curves for a 100-octane fuel and a 70-octane fuel show the relative difference in maximum torque available at different compression ratios. Using the 100-octane fuel no detonation was encountered, and the mixture strength and spark timing were adjusted to maximum torque at each compression ratio. With the 70-octane fuel the mixture was set for maximum torque, but it was necessary to adjust the spark to maintain detonation at a light knock intensity. At a compression of 5.5:1 both fuels gave the same torque. However, at a compression ratio of 6.5:1 it was necessary to retard the spark 6 deg. for the 70-octane fuel, resulting in a 2 per cent loss in torque. These figures illustrate rather well the compromise being used in modern engines in which high compression ratios are utilized to obtain good economy at light and intermediate loads. By employing a judicious control of the spark timing to control detonation on currently marketed fuels, some gain in power is realized at full load over that which would be obtained with lower compression ratio. The retardation of spark timing that in general is necessary entails the loss of only a very small percentage of the total amount of power that would be available on a non-knocking fuel at these compression ratios.

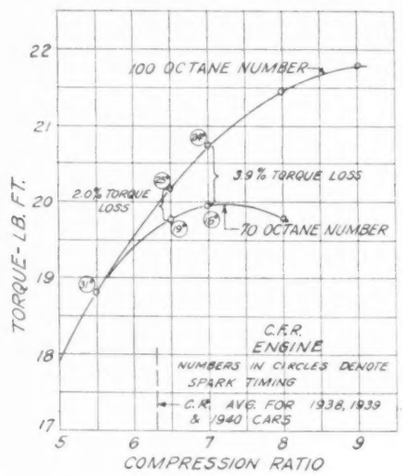

Fig. 1—Illustration of Torque Obtainable on Two Fuels at Several Compression Ratios

Data obtained by the Automotive Survey Committee on cars in normal service reveal to what extent this compromise actually results in a loss of power. With distributors set to factory specifications, Fig. 2 shows the average spark retard from that required for maximum torque, and also the resulting loss in torque. It will be noted that at low speeds the average standard distributor retards the spark 7 deg. and at high speeds 5 deg. This spark retard resulted in a 3 per cent loss in torque at low speeds, and less than a 2 per cent loss at high speeds for 13 cars.

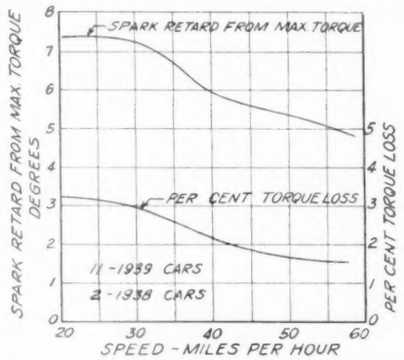
SPARK RETARD FROM MAX TORQUE
PER CENT TORQUE LOSS
11 - 1939 CARS
2 - 1938 CARS
SPARK RETARD FROM MAX TORQUE DEGREES
SPEED - MILES PER HOUR

Fig. 2—Average Spark Retard with Standard Distributor and Accompanying Loss of Torque in 13 Cars

In further confirmation of the above relationship, data were obtained on 28 cars at maximum-torque engine speed. At factory distributor setting the average spark-timing retard from that required for maximum torque was 6.4 deg. This resulted in an average loss in torque of 3 per cent. It may be interesting to note that in 20 of these cars additional data were obtained by setting the distributor to trace knock on a 70-octane fuel. The resulting retard in spark timing from that giving maximum torque was 6.8 deg. and a 3.1 per cent loss in torque It is thus quite evident that engines which have distributors set to factory specifications suffer only a small loss in power, which is of the order of 2 or 3 per cent. It is evident also that, when using regular-grade fuels of about 70 octane number, approximately the same reduction is experienced.

Economy

Inasmuch as cars are operated at part throttle the greater portion of the time, the effect of spark timing on economy at part load is probably of greater importance than its effect on performance at full load. The majority of 1938- and 1939-model engines have vacuum-controlled distributors which automatically advance the spark, when the throttle is partly closed, as much as 20 deg. from the full-load setting. Thus, although the spark may be retarded several degrees to prevent knock at full load, it is quite possible to obtain optimum timing at part load with regular fuels. To illustrate just what the spark-timing requirements for maximum economy are at various throttle openings, Fig. 3 has been prepared from data obtained on one 1939-model car. In this particular car the spark timing of the standard distributor at level-road load was almost identical with the curve shown for maximum economy.

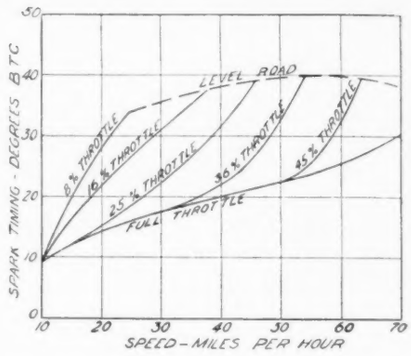

Fig. 3—Spark Timing for Maximum Economy at Various Throttle Openings on a 1939 Car

Although much has been said about the octane requirement at full throttle, few data are available on the octane requirement at part throttle. Fig. 4 shows a rather complete picture of the octane requirement of the same 1939 car at various throttle openings, with spark set for maximum economy as shown in Fig. 3. Each curve in Fig. 4 is obtained from a complete reference-fuel framework of incipient-knock spark-timing curves covering a wide range of reference fuels. It is surprising to note here just how low the octane requirement is at level-road load, being less than 15 octane number below 40 mph. and increasing up to only 55 octane number at 70 mph. The full-throttle maximum-performance octane requirement is well in line with other

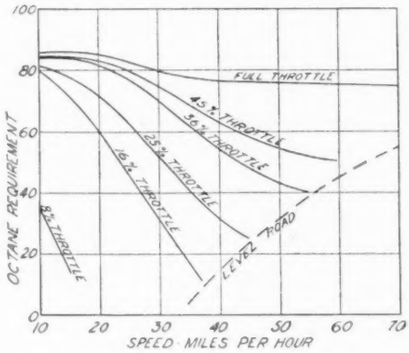

Fig. 4—Octane Requirements at Various Throttle Openings with Spark Set for Maximum Economy on 1939 Car

[a]Shell Oil Co., Inc., Wood River, Ill.
[a]Figures refer to bibliography on p. 6.

cars, varying from 86 octane number at low speed to 75 octane number at high speed. The difference between the level-road and full-throttle octane requirements is the price paid in octane number for the power necessary for acceleration and climbing hills.

In the previous discussion of the spark timing which is used at full throttle and that necessary for maximum economy under level-road conditions, it is quite evident that a distributor, which at factory setting gives optimum timing at part throttle, will be over-advanced if the basic setting is increased in an effort to gain a small amount of power at full load. The survey data shown in Table 1 give evidence that little is to be gained in economy by advancing the distributor. In one car slight loss in economy was experienced at an advanced setting. The car which shows a marked increase in economy was one which was not equipped with a part-throttle spark control.

TABLE 1

Effect of Basic Spark Advance on Part-Throttle Economy

Spark Advance (Degrees from Standard)	Per Cent Relative Fuel Economy at 40 MPH and Road Load Referred to Standard Spark Advance				
	1938 Car E	1938 Car A	1938 Car B	1938 Car C	1936 Car D
6 retarded	91.5	99.5	100.0	94.4	....
3 retarded	96.6	99.8	100.2	98.2	98.8
0	100.0	100.0	100.0	100.0	100.0
3 advanced	102.7	100.2	99.7	101.1	100.6
6 advanced	104.5	100.6	99.3	101.9	100.8
9 advanced	105.9	101.0	98.8	102.6	100.9
12 advanced	107.0	101.3	96.1	103.2	100.3

Causes of Wide Variation in Octane Requirement

The influence of spark timing on power and economy already has been shown, together with the octane number required under standard conditions. However, the maintenance of the ignition system at proper timing is also one of the major factors controlling the extremes in octane requirement of some cars. To demonstrate the necessity of care in adjusting the distributor basic settings, curves have been taken from the survey data for three low-priced cars. These curves, shown in Fig. 5, indicate the rapid change in octane requirement, corresponding to a change in the initial spark advance. Using data of eight cars, it was found that the average change in octane requirement per degree change in timing was approximately 1.5 octane units for retarded distributor, and approximately 1 octane unit for advanced distributor. This rapid change in octane requirement for relatively small changes in spark timing results in a rather wide spread of octane requirements in cars in which the ignition system properly is not maintained mechanically. The accessibility of most distributors adds to the possibility that they may be put in improper adjustment by operators who are not acquainted with the importance of proper ignition timing.

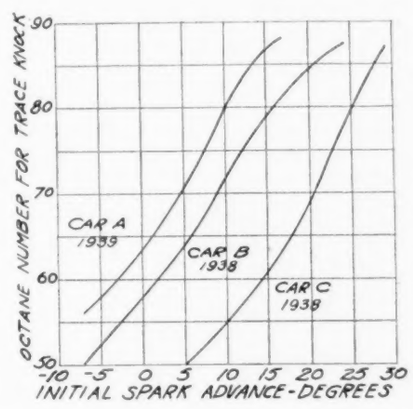

Fig. 5—Octane Number for Trace of Knock vs. Initial Spark Advance on Three Cars

In Fig. 6 octane numbers are plotted against the accumulated percentage of cars giving no knock, using cars as they operate in service, and also using cars with spark timing set to factory specifications. It will be seen that approximately 40 per cent had low octane requirements as a result of retarded timing, and that 5 per cent had extremely high requirements because of excessively advanced timing. It is also quite evident that, when the spark timing is corrected, the spread in octane requirements becomes much smaller. Although it may not be pertinent to the subject, the distribution curve for these same cars with combustion-chamber deposits removed is shown, illustrating rather definitely that deposit accumulation is another very important factor in raising the level of octane requirement.

Spark-Timing and Octane-Requirement Trends

One of the important services rendered by the survey conducted each year is the indication of the effect of changes in automotive equipment on the trend in fuel requirements from year to year. Also, any particular make of car which gets out of line at once will be evident. In this respect the surveys conducted in the last two years have accumulated considerable data on 1937, 1938, and 1939 cars, with considerable emphasis being placed on the Ford, Chevrolet, and Plymouth. Fig. 7 shows the basic distributor setting of these three cars, as found in service, plotted against the accumulated percentage of cars. It will be noted here that one car in particular shows a definite tendency toward retarded spark timing. For the other two makes the greater percentage of cars are grouped between 4 deg. retard and 4 deg. advance. Fig. 8 shows that in 1937 and 1938 approximately only 25 per cent of the cars were over-advanced from standard setting, whereas in 1939 approximately 50 per cent were over-advanced. Considering a total of 410 cars, including nearly all makes for 1937, 1938, and 1939, Fig. 9 shows a general tendency for the cars to have a slightly retarded spark timing, with 20 per cent being retarded more than 5 deg., and 5 per cent being advanced more than 5 deg.

This apparent lack of proper spark-timing maintenance of cars in service

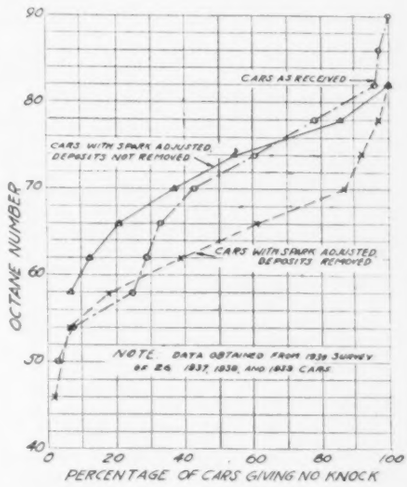

Fig. 6—Distribution of Octane Requirement Before and After Adjustment of Spark Timing and Deposit Removal

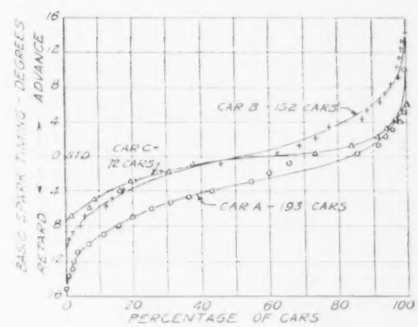

Fig. 7—Distribution of Variation of Spark Timing from Standard for Three Makes of 1937, 1938, and 1939 Cars

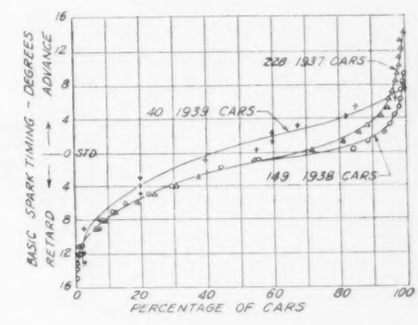

Fig. 8—Trend in Maintenance of Basic Spark Setting from 1937 to 1939

is reflected in the octane-requirement picture. Fig. 10 shows that, for 1937 and 1938 cars, approximately 75 per cent had octane requirements of 70 or lower, whereas 10 per cent had octane requirements of 75 or higher. Although hardly enough data were obtained in the 1939 survey to give a comparable distribution curve, the curves shown in Fig. 6 for cars, as received, indicate that the general octane-requirement level had increased in 1939. This corresponds in large part to the general increase in spark advance shown in Fig. 8.

Although data are not yet available on the 1940 API survey, data obtained in our own laboratory indicate that the general trend of advanced spark timing and octane requirements shown for 1939 probably will be increased this year. This is closely related, no doubt, to the general increase in regular-grade gasoline during the past two years to 74 octane number.

Conclusion

In conclusion, it must be pointed out that the modern engine is designed to operate on currently available fuels of 70 to 74 octane number. The compression ratio is such that fuels of that octane number give no trouble at part load, with mixture strength and spark timing adjusted to maximum economy. The rather insignificant loss of 2 or 3 per cent in power at full load, because of spark retard to prevent detonation, is taken care of amply by the size of the engine. It is not logical to assume that an increase in the octane number of fuel to 85 to prevent this small loss is a desire of the engine designer. When production of fuels of higher octane number is economically possible, it is safe to predict that compression ratios will be raised accordingly to get better economy; but the same compromise will have to be made at full load, and the spark retarded to prevent detonation.

Survey data of the past several years have served admirably to inform the engine builders and petroleum refiners of the performance of both their products in service. It has been shown that the power loss at full load, when the manufacturer's recommendations as to spark timing are adhered to, is no greater than was expected. The operation of engines on current fuels at part load is entirely satisfactory and allows maximum economy to be realized.

Although the general high level of octane requirements is caused to a considerable extent by the accumulation of combustion-chamber deposits, the excessively high octane numbers of present-day gasolines are a wasteful attempt to satisfy the few cars which have excessively advanced spark tim-

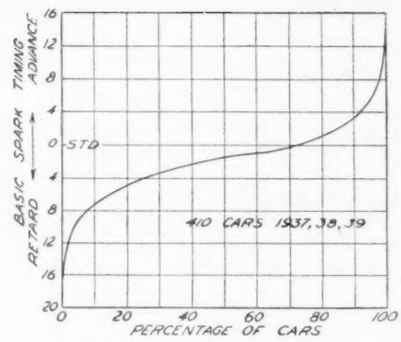

Fig. 9—Distribution of Basic Spark Timing of Cars as Found in Service

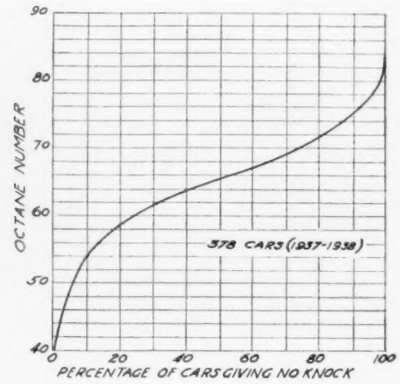

Fig. 10—Distribution of Octane Requirement of 1937 and 1938 Cars as Found in Service

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ing—often with actual reduction in performance.

It must be emphasized again that ignition timing should be maintained in accordance with the manufacturer's recommendation, both by maintaining the distributor in good mechanical condition, and by intelligent and judicious timing of the engine. Such maintenance would result in less unnecessary loss of power, and materially would reduce the number of cars of high octane requirement, which greatly have advanced spark timing either through neglect or unintelligent adjustment.

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Gasoline Improvements Influence Auto Trends

Oil industry improvements in gasoline anti-knock qualities and performance have had important influence on 4 trends in automobile design:

Greater comfort and better appearance.

Lower cost, both in purchase price and in operating expense.

Higher power.

More miles per gallon.

In discussing the extent to which these trends in car design have been affected by evolutions in fuels, T. A. Boyd and W. G. Lovell, Research Laboratories, General Motors Corp., in a paper to be presented before the 21st annual API convention report that gasoline and not cars set the pace.

They said cars must not get ahead of the trend in gasolines and that the car designer must bear in mind that the average car has a life of 8 years and must run on gasolines available over that period.

As an indication of the direction in which the auto makers are thinking, the paper also discusses possible influence of motor fuels of the future on automobile design. To show what the commercial distribution of fuels with higher octane ratings would mean in passenger car operation, charts to be presented show the gain in performance and economy with 100 as compared to 70 octane number gasoline.

At 20 mph., where the increase was altogether in miles per gallon, it amounted to more than 40%. This gain was not quite as large at higher speeds.

These lower values were attributed in part to the shape of the power-curve of the high compression engine, which was such as to give a residual gain in performance above that which could be converted into an improvement in miles per gallon without major engineering changes.

Similar data for the same engine, but with the compression ratio boosted to 10.3 to 1, and with the axle ratio further changed to give original performance at 20 to 30 mph. is to be outlined.

With this compression the researchers found a fuel above 100 octane was required; but the gains in miles per gallon were about 70% at 20 mph., about 65% at 40 mph. and about 50% at 60 mph.

From these two items of direct experimental evidence, the authors think it apparent that; "In spite of the sometimes expressed belief that nothing much can be gained by going higher in octane number, quite the contrary is true."

It is admitted, however, that under some conditions, mechanical limitations impose a barrier to the use of very high compression ratios. Nevertheless, it is believed possible in even such engines, through the use of supercharging, to utilize high-octane fuels to advantage—perhaps with gains in miles per gallon almost as large as those obtained by raising compression ratios.

The upward trend in octane number for regular-price gasoline during the period 1931-1940, represented an increase from below 60 to about

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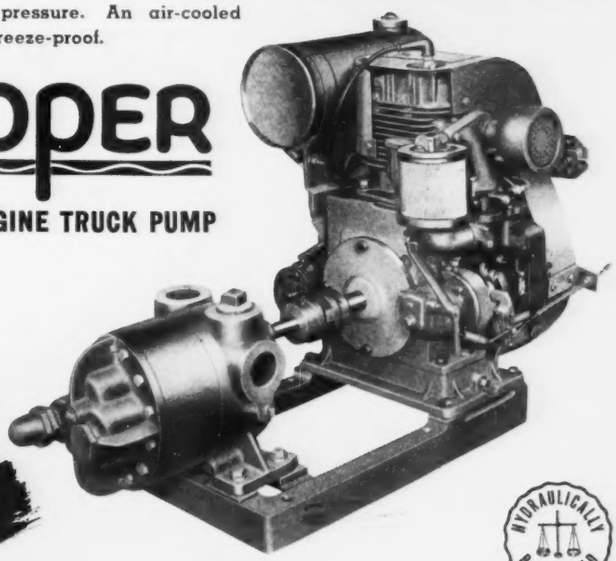

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75 (ASTM values since 1933). Also during this period, the improvement in gasoline volatility—or decrease in distillation temperature—amounted to more than 25° F. at the 50% point, and to from 10 to 20 degrees at other points. This is based on analysis of regular-grade gasolines marketed by 8 or 9 major distributors in the Detroit area.

It was claimed that the plentiful supply of gasoline at low cost, which has always been available in this country, has exerted a major influence both upon comfort and appearance of automobiles. It has been practical to build larger cars, with higher performance, as compared to smaller size and lower performance in Europe, where high gasoline cost is an important factor.

The downward trend in cost of operating an automobile has progressed, the authors said, to where direct cost is now only about half what it was in 1926. This does not include fixed or indirect operating costs, such as depreciation, insurance, garaging, license fees; but does include gasoline, oil, tires and repairs.

Taking as a measure of the relative amount of power the driver has at his command to propel the car, it was shown the trend in performance has been definitely upward. Over the past 10 years this factor has increased 25% at 50 mph. and more than 10% at 20 mph.

It was also emphasized that, along with this increased performance, has been a gain in economy. The economy factor taken by these investigators is ton-miles per gallon. Over the 10-year period, it shows an upward trend amounting to 25% at the higher speeds, and to 20% at lower speed.

While engine size has not changed appreciably during the past decade, it is shown that much more power is now available out of a given engine than formerly.

This increase in available power is credited to several sources. These include increased compression ratio, made possible by better fuels and improved combustion-chamber design. Higher compression has also yielded increased thermodynamic efficiency, to give more power per unit of displacement.

A large charge of fuel and air, or to make an engine that will breathe better, is cited as another way to improve power output. In terms of volumetric efficiency, it was shown engines have increased 10% in this respect at 50 mph. over the 10-years.

A further improvement designed to increase ability of an engine to give power has resulted from the use of cooler mixtures of fuel and air.

A reduction of 15 to 20 deg. F. in the mixture temperature is reflected over the 10-year period, the authors said. The ability to use cooler mixtures and induction systems with less restriction to air flow, is declared due in part to improvement in gasoline volatility.

MARKETS

Mid-Continent

TULSA, Nov. 9.—Despite mild weather, burning oil demand against contracts and on "market-price-date-of-shipment" basis continued brisk in the Mid-Continent, according to reports of refiners the past week. Stocks for most part were said to be low and closely held; several refiners reported attempting to accumulate winter stocks "with indifferent success". No changes in quotations or open spot sales were reported.

Gasoline demand continued good, according to most refiners, and "exceeded all expectations" of one Oklahoma refiner. Stiff competition in certain midwestern areas continued, another Oklahoma refiner said, and he reported quoting and selling 72-74 oct. at 4c for restricted shipment. Oklahoma refiners reported unrestricted quotations ranging from 4.50 to 5c for 72-74.

Grade 26-70 natural gasoline prices were reported unchanged with total of 30 cars reported sold open spot as follows: 21 cars at 2.75c, FOB Group 3, and 9 cars at 2.50c, FOB Breckenridge. Eight cars also were reported sold at 3c, FOB Oklahoma plant for Oklahoma delivery. Following sales were reported for prompt delivery, based on "market-price-date-of-shipment": 29 cars Grade 26-70, Group 3; 45 cars 22-lb., Group 3; and 6 cars Grade 26-70, FOB Oklahoma plant for Oklahoma delivery.

Pennsylvania

CLEVELAND, Nov. 9.—Kerosine and fuel oil prices were higher in western Pennsylvania, according to reports from the field the past week. Shipments of both products were in good volume, refiners said. Quotations for other products for the most part were reported unchanged.

In the upper field, quotations reported by refiners for 45 w.w. kerosine were up 0.125c at 5.125 to 5.375c, and one refiner reporting a quotation for 46 w.w. kerosine announced an 0.125c advance to 5.375c in his price, effective Nov. 11.

Quotations reported from the lower field for 45 w.w. kerosine ranged from 4.875 to 5c, up 0.125c on the low, and for 36-40 fuel oil 4.25 to 4.375c, up 0.25c on the low.

Several refiners reported quotations for Nos. 1, 2, and 3 fuel oils ranging from 4.875 to 5.25c in the upper field and 4.50 to 4.625c in the lower districts.

There were reports that 25 pour test bright stock was "freely available" at 10c inter-refinery, and unconfirmed reports that this oil was being offered to the jobbing and compounding trade at the same price. Quotations reported by refiners to jobbers and compounders ranged from 12 to 13c.

Mid-Western

CHICAGO, Nov. 9.—Demand for burner fuels was good the past week, according to reports of refiners and tank car marketers in Chicago. Range oil shipments also were reported heavy by most sellers. Several refiners said industrial fuel demand was "picking up", with large orders from steel companies in the Chicago area. Quotations for the most part were reported unchanged.

Open spot sales reported during the week by 4 tank car marketers totaled as follows: 22 cars of 72-74 oct. gasoline at 3.875c; 5 cars of 63-66 oct., 4 cars at 3.375c, and 1 car at 3.50c; 1 car of 60 oct. & below at 3.125c; 1 car of 42-44 kerosine at 3.75c; 1 car of No. 1 p. w. fuel at 3.50c; and 8 cars of No. 2 fuel, 5 cars at 3.125c; 3 cars at 3.25c, all FOB Group 3.

Six marketers reported quoting 3.875c for 72-74 oct., 3.375 to 3.75c for 63-66 oct., 3 to 3.50c for 60 oct. & below, 3.375 to 4c for 42-44 kerosine, 3.25 to 3.50c for No. 1 p. w., and 3.125 to 3.375c for No. 2 fuel.

Group 3 quotations reported by refiners ranged from 4.50 to 5c for 72-74 oct., 4.125 to 4.50c for 63-66 oct., 3.75 to 4.25c for 60 oct. & below, 3.875 to 4.125c for 42-44 kerosine, 3.50 to 3.75c for No. 1 p. w., and 3.375 to 3.50c for No. 2 fuel.

Atlantic Coast

NEW YORK, Nov. 9.—Light and heavy fuel oils were quoted at higher prices at many points along the Atlantic coast the past week, according to reports of suppliers. Cold weather and advancing tanker rates from the Gulf were cited by many suppliers as reasons for the advances.

Nos. 2 and 3 fuels were up 0.4c at New York to 4.50c tank cars, 4.40c barges; at Philadelphia, Baltimore and Norfolk, up 0.25c to 4.25c. Quotations for Nos. 2 and 3 oils were up 0.2c to 4.70c at Portland, 4.60c at Boston and Providence.

Advances of 0.4c in his quotations for kerosine, to 5.50c tank cars, 5.40c barges, at New York, and 0.25c to 5.50c at Philadelphia, Baltimore and Norfolk also were reported by one supplier. At New York, quotations for kerosine ranged upwards from 5.10c and 5c, in tank cars and barge, respectively.

Eight suppliers reported 15c advances in their quotations for marine diesel oil, ships' bunkers, at all points along the seaboard. Quotations at New York harbor were at $1.85.

Gulf

NEW YORK, Nov. 9.—Gulf markets were reported quiet the past week. With the exception of two inquiries for cargoes of Grade "C" fuel oil and one sale of the same oil at $0.80, no activity was reported.

"High boat rates" were cited by some refiners as the cause for lack of buying interest at the Gulf. Kerosine was reported "firm" at 3.875c. Several cargoes of No. 2 fuel were being offered at 3.25c, it was said. Gasoline prices were reported unchanged.

California

LOS ANGELES, Nov. 9.—Pacific foreign buyers, chiefly representing Oriental interests, were responsible for considerable increase in inquiries received by exporters the past week, according to reports here. So far as could be learned, no sales resulted but suppliers were optimistic and considered the outlook more favorable than at any time in the past six months.

Russian interests were said to be again attempting to place an order with California independent refiners for shipment in February or March of several cargoes of U. S. Motor Gasoline at about 5c per gallon. Independent suppliers were said not to have been interested in previous inquiries from the same source for more than twice that quantity at the same price.

Independent refiners with terminal facilities in the Los Angeles harbor district were offering bunker C fuel oil at $0.60 per bbl., according to reports.

In the domestic market, fuel oils were reported in good demand at $0.45 to $0.50 per bbl. for heavy oil and $0.55 to $0.60 for light oil at independent plants in the Los Angeles Basin.

REFINERY and SEABOARD PRICES

In bulk lots by Motor Transport, Tank Car, Barge or Tanker as shown

(NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.)

HOW PRICES ARE REPORTED—

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Prices arrived at by discounts off a specified price or "market date of shipment," prices named in contracts or prices arrived at in accordance with any arrangement made prior to date of sale, are not for "open spot" transactions and therefore are not considered in making the price tables. Prices made to brokers and prices in "inter-refinery" transactions are also not considered except as may be noted.

All prices are for "immediate" shipment except in Gulf Coast bulk transactions where shipment is generally to be made in ninety days. Prices are FOB refineries, pipelines, or tanker terminals in districts designated.

Prices shown are for quantities in bulk such as tank car lots, motor transport lots or barge lots; and in cents per gallon; heavy fuel oils are in dollars per barrel of 42 U.S. gallons; wax and petrolatums are in cents per pound. Prices applying to barges or cargoes only are so designated.

Prices do not include taxes or inspection fees. Prices are published at the close of the business day.

Mid-Western prices in the tables were gathered from refiners with offices located in Chicago and the surrounding territory. While the prices are quoted on a Group 3 (Oklahoma) freight basis, this is in accordance with the custom of the oil industry which uses Group 3 as a price basis for the ease of comparing prices even when the material originates in another refining district. Other refinery prices are given by and for the particular refining district where the material is made and from which it is shipped.

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Any apparent error should be reported to the nearest OILGRAM or National Petroleum News office at once as no correction will be made after the second issue of the OILGRAM or National Petroleum News following its publication.

Summary of Daily Gasoline Prices (Nov. 5 to Nov. 12)

	Latest Prices Mon. Nov. 12	Nov. 8	Nov. 7	Nov. 6	Nov. 5
U. S. Motor, (ASTM octane)					
72-74 octane:					
Oklahoma	(u) 4.50 –5.00	(u) 4.50 –5.00	(u) 4.50 –5.00	(u) 4.50 –5.00	u) 4.50 –5.00
Mid-Western (Group 3 basis)	4.50 – 5.00	4.50 – 5.00	4.50 – 5.00	4.50 – 5.00	4.50 – 5.00
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	4.50 – 5.25	4.50 – 5.25	4.50 – 5.25	4.50 – 5.25	4.50 – 5.25
W. Tex. (For shpt. to Tex. & N.M. dest'ns.)	5.00 (2)	5.00 (2)	5.00 (2)	5.00(2)	5.00(2)
63-66 octane:					
Oklahoma	4.125– 4.50	4.125– 4.50	4.125– 4.50	4.125– 4.50	4.125– 4.50
Mid-Western (Group 3 basis)	4.125– 4.50	4.125– 4.50	4.125– 4.50	4.125– 4.50	4.125– 4.50
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	4.125– 5.00	4.125– 5.00	4.125– 5.00	4.125– 5.00	4.125– 5.00
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	4.50 (2)	4.50 (2)	4.50 (2)	4.50 (2)	4.50 (2)
60 octane & below:					
Oklahoma	3.75 – 4.25	3.75 – 4.25	3.75 – 4.25	3.75 – 4.25	3.75 – 4.25
Mid-Western (Group 3 basis)	3.75 – 4.25	3.75 – 4.25	3.75 – 4.25	3.75 – 4.25	3.75 – 4.25
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	3.75 – 4.50	3.75 – 4.50	3.75 – 4.50	3.75 – 4.50	3.75 – 4.50
W. Tex. (For shpt. to Tex. & N. M. dest ns.)	4.00 (2)	4.00 (2)	4.00 (2)	4.00 (2)	4.00 (2)
Motor Gasoline, 72-74 octane (ASTM)					
New York harbor	5.00 – 6.50	5.00 – 6.50	5.00 – 6.50	5.00 – 6.50	5.00 – 6.50
Philadelphia district	5.25 – 7.00	5.25 – 7.00	5.25 – 7.00	5.25 – 7.00	5.25 – 7.00
Baltimore district	5.50 – 7.00	5.50 – 7.00	5.50 – 7.00	5.50 – 7.25	5.50 – 7.25
Motor Gasoline:					
74-76 Octane: (L-3)					
Bradford-Warren (Western Penna.)	6.00	6.00	6.00	6.00	6.00
Other Districts (Western Penna.)	5.75 – 6.00	5.75 – 6.00	5.75 – 6.00	5.75 – 6.00	5.75 – 6.00
72-73 Octane: (L-3)					
Bradford-Warren (Western Penna.)	5.75 (2)	5.75 (2)	5.75 (2)	5.75 (2)	5.75 (2)
Other Districts (Western Penna.)	.....	.....	.....	.....	.....

REFINERY PRICES

Gasoline U. S. Motor (ASTM Octane) except where otherwise specified

Prices Effective	Nov. 12	Nov. 4
OKLAHOMA		
72-74 oct.	(u) 4.50 –5.00	(u) 4.50 –5.00
63-66 oct.	4.125– 4.50	4.125– 4.50
60 oct. & below	3.75 – 4.25	3.75 – 4.25
60-62 400 e.p.	4.00 (2)	4.00 (2)
MID-WESTERN		
72-74 oct.	4.50 – 5.00	4.50 – 5.00
63-66 oct.	4.125– 4.50	4.125– 4.50
60 oct. & below	3.75 – 4.25	3.75 – 4.25
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
72-74 oct.	4.50 – 5.25	4.50 – 5.25
63-66 oct.	4.125– 5.00	4.125– 5.00
60 oct. & below	3.75 – 4.50	3.75 – 4.50
60-62, 400 e.p.	4.25–4.75 (2)	4.25–4.75 (2)
W. TEX. (For shpt. to Tex. & N. M. dest'ns.		
72-74 oct.	5.00 (2)	5.00 (2)
63-66 oct.	4.50 (2)	4.50 (2)
60 oct. & below	4.00 (2)	4.00 (2)
CENT. W. TEX. (Prices to truck transports)		
72-74 oct. (L-3)	4.625 (1)	4.625 (1)
67-69 oct. (L-3)	3.875 (1)	3.875 (1)
62 oct. & below(L-3)	3.50 (1)	3.50 (1)
KANSAS (For Kansas destinations only)		
72-74 oct.	4.875– 5.125	4.875– 5.125
63-66 oct.	4.50 – 4.75	4.50 – 4.75
60 oct. & below	4.125– 4.375	4.125– 4.375

Prices Effective	Nov. 12	Nov. 4
ARK. (FOB Ark. plant of one refiner. for shipment to Ark. & La.)		
72-74 oct.	4.625	4.625
70-72 oct.	4.50	4.50
60 oct. & below	4.125	4.125
WESTERN PENNA. (Motor gasoline.		
Bradford-Warren:		
74-76 oct. (L-3)	6.00	6.00
72-73 oct. (L-3)	5.75 (2)	5.75 (2)
Other districts:		
74-76 oct. (L-3)	5.75 – 6.00	5.75 – 6.00
72-73 oct. (L-3)	.....	.....
Naphtha		
Untreated naphtha	5.50 – 5.75	5.50 – 5.75
Stoddard Solvent	6.00 – 6.25	6.00 – 6.25
CENTRAL MICHIGAN (f)		
U.S. Motor: (Oct. L-3)		
72-74 oct.	6.25 – 7.00	6.25 – 7.00
67-69 oct.	5.50 – 6.25	5.50 – 6.25
Str.-Run Gasoline	(g) 4.25 5.00	(g) 4.25–5.00
OHIO (S. O. Ohio quotations or statewide delivery and subject to exceptions for local price disturbances)		
72-74 oct.	7.125	7.125
CALIFORNIA U.S. Motor:		
58-61 grav., 375-400 e.p., 65 oct. & above	5.50 – 7.00	5.50 – 7.00
54-58 grav., for outside state shipment	5.00 – 6.00	5.00 – 6.25
54-58 grav., for instate shipment	4.50 – 5.50	4.50 – 6.00

Kerosine, Gas & Fuel Oils

Prices Effective	Nov. 12	Nov. 4
OKLAHOMA		
41-43 grav. w.w.	3.875– 4.00	3.875– 4.00
42-44 grav., w.w.	4.00 – 4.125	4.00 – 4.125
Range Oil	3.50 – 3.75	3.50 – 3.75
No. 1 P.W.	3.50 – 3.75	3.50 – 3.75
No. 1 straw	3.375– 3.50	3.375– 3.50
No. 2 straw	3.375– 3.625	3.375– 3.625
No. 2 dark	3.375 (1)	3.375 (1)
U.G.I. gas oil	3.25 (2)	3.25 (2)
No. 3 fuel	3.25–3.375 (2)	3.25–3.375(2)
No. 6 fuel	$0.55 (1)	$0.55 (1)
14-16 fuel	$0.85 (1)	$0.85 (1)
MID-WESTERN		
41-43 grav. w.w.	3.875– 4.125	3.875– 4.125
42-44 grav. w.w.	4.00 – 4.375	4.00 – 4.375
Range Oil	3.625 (2)	3.625 (2)
No. 1 p.w.	3.50 – 3.75	3.50 – 3.75
No. 1 straw	.....	.....
No. 2 straw	3.375– 3.50	3.375– 3.50
No. 3	3.125– 3.375	3.125– 3.375
No. 5	$0.75 (1)	$0.75 (1)
No. 6	$0.50 (1)	$0.50 (1)
N. TEX. (For shpt. to Tex. & N. M dest'ns.		
41-43 grav. w.w.	3.50 – 4.75	3.50 – 4.75
No. 1 P.W.	3.50-3.75 (2)	3.50-3.75 (2)
KANSAS (For Kansas destinations only)		
41-43 grav. w.w.	4.25 (1)	4.25 (1)
42-44 gravity w.w.	4.125– 4.375	4.125– 4.375
No. 1 p.w.	3.75 – 3.875	3.75 – 3.875
No. 6 fuel	$0.60-$0.625 (2)	$0.60-$0.625 (2)

(f) Prices FOB Central Michigan refinery group basis for shipment within Michigan: shipments may originate at plants outside Central group. (g) Excluding Detroit shipment. (h) For shipment to Ark. points only. (u) One refiner reports quoting "4 to 4.50c" for 72-74 oct., the lower price applying only to shipment into restricted competitive areas.

REFINERY PRICES (Continued)

(NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.)

Kerosine, Gas & Fuel Oil

Continued)

Prices Effective	Nov. 12	Nov. 4
ARK. (F.o.b. Ark. plant of one refiner for shipment to Ark. and La.)		
41-43 grav. w.w.	4.25	4.25
No. 1	3.625	3.625
No. 2	3.375	3.375
28-32 zero fuel	3.25	3.25
Tractor Fuel	(h) 4.25	(h)4.25
WESTERN PENNA.		
Bradford-Warren:		
45 grav. w.w.	5.125– 5.375	5.00 – 5.375
46 grav. w.w.	5.375 (1)	5.25 (1)
No. 1 fuel	4.875–5.00 (2)	
No. 2 "	4.875– 5.25	
No. 3 "	4.875 (1)	
36-40 gravity	5.00 – 5.25	5.00 – 5.25
Other districts:		
45 grav. w.w.	4.875– 5.00	4.875– 5.00
46 grav. w.w.	4.875– 5.125	4.875– 5.125
47 grav. w.w.	4.875– 5.25	4.875– 5.25
No. 1 fuel	4.75 – 4.625	
No. 2 "	4.50 – 4.625	
No. 3 "	4.50 (2)	
36-40 gravity	(l) 4.25 – 4.375 (l)	4.125–4.25
CENTRAL MICHIGAN (f)		
47-49 gravity w.w.	4.75 – 5.05	4.75 – 5.05
P.W. Distillate	4.75 – 4.875	4.75 – 4.875
No. 3 gas oil, Str.	4.25 – 4.50	4.25 – 4.50
U.G.I gas oil	3.50 – 4.00	3.50 – 4.00
Fuel Oils (Vis. at 100):		
500-700 Vis.	2.75–3.00 (2)	2.75–3.00 (2)
300-500 Vis.	2.75–3.25 (2)	2.75–3.25 (2)
100-300 Vis.	3.25–3.50 (1)	3.25–3.50 (1)
CALIFORNIA		
40-43 grav. w.w.	4.50 – 6.00	4.50 – 6.00
San Joaquin Valley:		
Heavy fuel	$0.45 –$0.70	$0.40 –$0.70
Light fuel	$0.55 –$0.75	$0.45 –$0.75
Diesel fuel	2.75 – 4.00	2.75 – 4.00
Stove dist.	2.75 – 5.00	2.75 – 5.00
Los Angeles:		
Heavy fuel	$0.45 –$0.70	$0.40 –$0.65
Light fuel	$0.55 –$0.75	$0.45 –$0.75
Diesel fuel	2.75 – 4.00	2.50 – 4.00
Stove dist.	2.75 – 4.00	2.50 – 4.00
San Francisco:		
Heavy fuel	$0.80	$0.80
Light fuel	$0.90	$0.90
Diesel fuel	4.50	4.50
Stove dist.	5.50	5.50

Note: All above heavy fuels meet Pacific specification 400; light fuel, spec. 300; Diesel fuels, spec. 200; and stove distillate, spec 100.

Lubricating Oils

WESTERN PENNA.

Prices are given by Penna. refiners as their quotations to jobbing and compounding trade only. Prices to other refiners generally are lower.

Viscous Neutrals — No. 3 col. Vis. at 70° F.

200 Vis. (180 at 100°) 420-425 fl.		
0 p.t.	24.50 (1)	24.50 (1)
10 p.t.	23.50 (1)	23.50 (1)
15 p.t.	22.50 (1)	22.50 (1)
25 p.t.	21.00	21.00
150 Vis. (143 at 100) 400-405 fl.		
0 p.t.	22.50 (1)	22.50 (1)
10 p.t.	21.50 (1)	21.50 (1)
15 p.t.	20.50 (1)	20.50 (1)
25 p.t.	19.00	19.00
Cylinder Stocks		
Brt. stk., 145-155 vis. at 210°, 540-550 fl., No. 8 col.		
10 p.t.	14.50 (1)	14.50 (1)
15 p.t.	13.50 (1)	13.50 (1)
25 p.t.	12.00 –13.00	12.00 –13.00
600 S.R. filterable	7.00 – 7.50	7.00 – 7.50
650 S.R.	8.00 – 8.50	8.00 – 8.50
600 fl.	9.00 – 9.50	9.00 – 9.50
630 fl.	11.00 –11.50	11.00 –12.00

MID-CONTINENT (F.o.b. Tulsa)

Neutral Oils (Vis. at 100° F. 0 to 10 P.P.)
Pale Oils:

Vis.	Color		
60-85	No. 2	5.25 – 5.75	5.25 – 5.75
86-110	No. 2	5.25 – 6.25	5.25 – 6.25
150	No. 3	8.00 –10.25	8.00 –10.25
180	No. 3	8.50 –10.50	8.50 –10.50
200	No. 3	8.50 –11.00	8.50 –11.00
250	No. 3	10.00 –12.00	10.00 –12.00
280	No. 3	10.50 –13.75	10.50 –13.75
300	No. 3	11.50 –14.25	11.50 –14.25

Lubricating Oils (Cont'd)

Prices Effective	Nov. 12	Nov. 4
Red Oils:		
180—No. 5	8.50–9.00 (2)	8.50–9.00 (2)
200—No. 5	8.50–10.00 (2)	8.50–10.00 (2)
280—No. 5	11.50–12.00 (2)	11.50–12.00 (2)
300—No. 5	11.00 –12.00	11.00 –12.00

Note: Viscous Neutrals, 15-25 p.p. generally are quoted 0.5c under 0-10 p.p. oils. Non-viscous oils, 15-25 p.p., generally are quoted 0.25c under 0-10 p.p. oils.

Bright Stock—Vis. at 210°

200 Vis. D	18.00 (1)	18.00 (1)
150-160 Vis. D:		
0 to 10 p.p.	13.50 –16.00	13.50 –16.00
10 to 25 p.p.	13.00 –15.50	13.00 –15.50
25 to 40 p.p.	12.50–15.00 (2)	12.50–15.00 (2)
150-160 vis. E	12.50 –15.00	12.50 –15.00
120 Vis. D:		
0 to 10 p.p.	12.50 –15.25	12.50 –15.25
25 to 40 p.p.	14.375 (1)	14.375 (1)
600 S.R. Dark Green	7.00 (2)	7.00 (2)
600 S.R. Olive Green	8.00 – 9.50	8.00 – 9.50
631 S.R.	12.00 (1)	12.00 (1)
Black Oil	4.00–5.50 (2)	4.00–5.50 (2)

SOUTH TEXAS Neutral Oils

Vis.	Color		
Pale Oils: (*Vis. at 100°F*)			
100	No. 1½-2½	5.25 – 5.50	5.25 – 5.50
200	No. 2-3	7.25	7.25
300	No. 2-3	7.75	7.75
500	No. 2½-3½	8.50	8.50
750	No. 3-4	8.75	8.75
1200	No. 3-4	8.875	8.875
2000	No. 4	9.00	9.00
Red Oils:			
200	No. 5-6	7.25	7.25
300	No. 5-6	7.75	7.75
500	No. 5-6	8.50	8.50
750	No. 5-6	8.75	8.75
1200	No. 5-6	8.875	8.875
2000	No. 5-6	9.00	9.00

CHICAGO (From Mid-Continent p.l. crude

Neutra Oils (Vis. at 100° F. 0 to 10 p.p.)

Pale Oils

Vis.	Color		
60-85	No. 2	7.25	7.25
86-110	No. 2	7.25	7.25
150	No. 3	8.50	8.50
180	No. 3	9.50	9.50
200	No. 3	10.00	10.00
250	No. 3	11.00	11.00
Red Oils:			
180	No. 5	9.50	9.50
200	No. 5	9.50	9.50
250	No. 5	11.00	11.00
280	No. 5	12.00	12.00
300	No. 5	12.00	12.00

Note: Viscous oils, 15 to 30 p.p. are quoted 0.5c lower; 60-85 and 86-110 No. 2 non-viscous oils, 15 to 30 p.p., 0.25c lower.

Unfiltered Steam Refined: (Viscosity at 210°)

140	8.75	8.75
160	9.50	9.50
200	10.50	10.50
Bright stocks, 160 vis. at 210, No. 8 color:		
0 to 10 p.p.	15.00	15.00
15 to 25 p.p.	14.00	14.00
30 to 40 p.p.	13.50	13.50
E filtered Cyl. Stock	12.50	12.50

Note: To obtain prices delivered in Chicago add 0.25c per gal.

Natural Gasoline

(Group 3 & Breckenridge prices are to blenders on freight basis shown below. Shipments may originate in any Mid-Continent manufacturing district.)

FOB GROUP 3		
Grade 26-70	(k) 2.75	(k)2.75
FOB BRECKENRIDGE		
Grade 26-70	(k) 2.00	(k)2.50
CALIFORNIA (FOB plants in Los Angeles basin)		
75-85, 350-375 e.p. for blending	4.75 – 5.00	4.75 – 5.00

Naphtha and Solvent

Prices Effective	Nov. 12	Nov. 4
(FOB Group 3)		
Stoddard solvent	5.875	5.875
Cleaners' naphtha	6.375	6.375
V. M. & P. naphtha	6.375	6.375
Mineral spirits	5.375	5.375
Rubber solvent	6.375	6.375
Lacquer diluent	6.625– 7.375	6.625– 7.375
Benzol Diluent	7.875– 8.375	7.875– 8.375

Wax

White Crude Scale:

WESTERN PENNA. (Bbls., C.L., N. Y.)		
122-124 A.m.p.	2.85 – 3.00	2.85 – 3.00
124-126 A.m.p.	2.85 – 3.00	2.85 – 3.00
OKLAHOMA (Bbls. or burlap bags, C.L.)		
124-6 AMP.	3.00 (1)	3.00 (1)
131-3 AMP.	3.25 (1)	3.25 (1)

CHICAGO (FOB Chicago district refinery of one refiner, in bags or slabs loose, carloads. Melting points are EMP (ASTM) methods; add 3° F. to convert into AMP.)

Fully refined:		
122-124 (bags only)	5.60	5.60
125-127	5.60	5.60
127-129	5.85	5.85
130-132	6.15	6.15
132-134	6.40	6.40
135-137	7.15	7.15

Petrolatums

WESTERN PENNA. (Bbls., carloads; tank cars, 0.5c per lb. less.)		
Snow White	5.125– 6.125	5.125– 6.125
Lily White	4.375– 5.125	4.375– 5.125
Cream White	3.375– 4.125	3.375– 4.125
Light Amber	2.625– 3.00	2.625– 3.00
Amber	2.375– 2.875	2.375– 2.875
Red	2.125– 2.625	2.125– 2.625

Group 3 Freight Rates

To Division Headquarters Points of Standard Oil Co. of Indiana

	Gasoline-Kerosine Cents per Cwt.	Gasoline-Kerosine Cents per gal. 6.6 lbs.	Distillate-Gas Oil-Fuel Oil Cents per Cwt.	Distillate-Gas Oil-Fuel Oil Cents per gal. 7.4 lbs.
Chicago, Ill.	40	2.640	32	2.368
Decatur, Ill.	39	2.574	31	2.294
Joliet, Ill.	40	2.640	32	2.368
Peoria, Ill.	39	2.574	31	2.294
Quincy, Ill.	36	2.376	29	2.146
Indianapolis, Ind.	48	3.168	39	2.886
Evansville, Ind.	46	3.036	37	2.738
South Bend, Ind.	49	3.234	**42	**3.108
Detroit, Mich.	64	4.224	51	3.774
Grand Rapids, Mich.	58.5	3.861	**50	**3.700
Saginaw, Mich.	66	4.356	53	3.922
Green Bay, Wis.	51	3.366	41	3.034
Milwaukee, Wis.	43	2.838	34.5	2.553
LaCrosse, Wis.	46	3.036	37	2.738
Minneapolis-St. Paul	46	3.036	37	2.738
Duluth, Minn.	52	3.432	41.5	3.071
Mankato, Minn.	46	3.036	37	2.738
Des Moines, Ia.	36	2.376	29	2.146
Davenport, Ia.	39	2.574	31	2.294
Mason City, Ia.	42	2.772	33.5	2.479
St. Louis, Mo.	33	2.178	26.5	1.961
Kansas City, Mo.	28	1.848	22.5	1.665
St. Joseph, Mo.	28	1.848	22.5	1.665
Fargo, N. D.	63	4.158	50.5	3.737
Minot, N. D.	83	5.478	66.5	4.921
Huron, S. D.	53	3.498	42.5	3.145
Wichita				
From Ponca City	7.5	*0.495	7.5	†0.555
From Tulsa	12.5	*0.825	12.5	†0.925
From Cushing	11	*0.726	11	†0.814

*This rate also includes distillate rate at 6.6 lbs. per gal.

**This rate applies only to residual fuel and gas oil.

†This rate is exclusive of distillate which is based on 6.6 lbs. per gal. from Ponca City, Tulsa and Cushing, Okla., to Wichita. Includes only gas oil and fuel oil.

NOTE: There is no Group 3 rate to Wichita, Kans.

(f) Prices FOB Central Michigan refinery group basis for shipment within Michigan: shipments may originate at plants outside Central group. (g) Excluding Detroit shipment. (h) For shipment to Ark. points only. (i) Quotations. (j) Sale. (k) Sales. (l) Pittsburgh district prices excluded.

SEABOARD PRICES EXPORT AND COASTWISE

(NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.)

Atlantic Coast

(Prices are of refiners, FOB their refineries & their tanker terminals, & of tanker terminal operators, FOB their terminals)—Prices Effective Nov. 12

MOTOR GASOLINE

District:	Min. 80 Oct. '39 Research (Max. 2 cc. Lead)	72-74 Oct. (ASTM)	68-70 Oct. (ASTM)	65-66 Oct. (ASTM)	60-64 Oct. (ASTM)
N. Y. Harb.	5.75 (2)	5.00 – 6.50	5.00 – 5.50	5.00 – 5.75	5.75–6.00 (2)
N. Y. Harb., barges	5.75 – 7.00	4.75 – 6.50	4.75 (2)	4.75 – 5.75	5.75–6.00 (2)
Albany	5.70 (1)	5.60	.....	.....	.....
Philadelphia	5.75 – 7.25	5.25 – 7.00	6.25 – 6.75	5.70 (1)	5.50 – 6.75
Baltimore	5.75 – 7.25	5.50 – 7.00	6.00 (1)	5.50 (1)	5.50 – 6.50
Norfolk	5.75 – 7.50	5.50 – 6.75	6.00–6.50 (2)	5.50 (1)	5.50 (1)
Wilm'ton	7.00 – 7.25	5.75 – 7.00	6.00 – 6.50	5.50 (1)	5.50 – 6.50
Char'ston	6.25–7.05 (2)	5.75 – 7.05	5.875–6.50 (2)	5.50 (1)	5.75–6.50 (2)
Savannah	6.25–6.50 (1)	6.25 – 6.50	5.875–6.375	.....	5.75–6.00 (2)
Jacksonville	6.25–6.50 (1)	6.25 – 6.50	5.875– 6.25	.....	5.375–6.00
Miami	6.25–6.50 (1)	6.25 (1)	5.875–6.125 (2)	.....	5.00 (1)
Tampa	6.25–6.50 (1)	6.25 (2)	5.875–6.125 (2)	.....	5.375–5.75 (2)
Pensacola	6.00–6.25 (1)	.....	5.50–5.75 (1)	.....	.....
Mobile	5.75–6.00 (1)	5.75 (2)	5.375–5.625 (2)	.....	5.00–5.375 (2)
Portland	5.70 (2)	5.70	5.70 (1)	.....	.....
Boston	5.70 (2)	5.25 – 5.70	5.50 (1)	5.25 – 5.70	5.45 (2)
Providence	5.60 (2)	5.70 – 6.50	.....	5.60 (1)	5.45–6.00 (2)

FUEL OILS

	KEROSINE and or NO. 1 FUEL	No. 2	No. 3	No. 5	No. 6
N. Y. Harb.	5.10 – 5.50	4.50	4.50	$1.35 –$1.55	$1.15 –$1.25
N. Y. Harb., barges	5.00 – 5.40	(k) 4.40	(k) 4.40	.....	.....
Albany	5.20	4.60	4.60 (1)	$1.85 (1)	$1.45 (1)
Philadelphia	5.00 – 5.50	4.25 – 4.50	4.25 – 4.50	$1.37 –$1.47	$1.15 –$1.25
Baltimore	4.75 – 5.50	4.25 – 4.50	4.25 – 4.50	$1.37 (1)	$1.15 –$1.25
Norfolk	4.75 – 5.50	4.25 – 4.50	4.25 – 4.50	.....	$1.25 (2)
Wilmington	4.75 – 5.25	4.25	.....	.....	.....
Charleston	4.75 – 5.00	4.25 (2)	.....	.....	$1.20 (2)
Savannah	5.00 – 5.25	.....	.....	.....	$1.20 (1)
Jacksonville	5.00 – 5.25	4.25 (1)	4.25 (1)	.....	$1.20 (1)
Miami	5.125–5.25 (2)	.....	.....	.....	.....
Tampa	5.00 – 5.25	4.25 (1)	.....	.....	$1.15 (1)
Pensacola	5.125–5.25 (1)	.....	.....	.....	.....
Mobile	4.875– 5.00	.....	.....	.....	.....
Portland	5.30	4.70	4.70	$1.85 (1)	$1.25 –$1.45
Boston	5.20	4.60	4.60	$1.55 $1.65 (2)	$1.25
Providence	5.20	4.60	4.60	$1.50 –$1.65	$1.25

	Bunker C Fuel Ships' bunkers (Ex Lighterage)	Diesel Oil Ships' bunkers (Ex Lighterage)	Diesel Oil Shore Plants	Gas House Gas Oil 28-34 Gravity
N. Y. harbor	$1.15 –$1.25	$1.85	4.50	4.60
Albany	$1.45 (1)	$1.85	4.60	.....
Philadelphia	$1.15 –$1.25	$1.85 –$1.95	.....	.....
Baltimore	$1.15 –$1.25	$1.85	4.00	4.00
Norfolk	$1.25	$1.785–$1.85	4.00	4.00
Charleston	$1.20	$1.785–$1.85	4.00	4.00
Savannah	$1.20 (1)	$1.785–$1.90	.....	.....
Jacksonville	$1.20	$1.785–$1.95	.....	.....
Tampa	$1.15	$1.785–$1.95	.....	.....
Portland	$1.25 –$1.45	$1.95	4.70	4.80
Boston	$1.25	$1.85	4.60	4.70
Providence	$1.25	$1.85	4.60	4.70

New York Export Lubes

(Penna. Products in bbls. FAS New York)

Prices Effective	Nov. 12	Nov. 4
Bright stock:		
Light, 25 p.t.	20.50 (1)	20.50 (1)
Neutral oil:		
200 3 color, 25 p.t.	.....	.....
150 3 color, 25 p.t.	25.50 (1)	25.50 (1)
600 s.r., unfilt.	16.00 (1)	16.00 (1)
650 s.r., unfilt.	17.00 (1)	17.00 (1)
600 fl. s.r.	18.00 (1)	18.00 (1)
630 fl., s.r.	20.00 (1)	20.00 (1)

Wax

(A.S.T.M. Tests. Melting points, however, are A.M.P., 3° higher than E.M.P. Export prices, FAS, c.l. Domestic prices, FOB, refr'ies., in bags, c.l., with 0.2c discount allowed for shipment in bulk, except where noted. Scale solid; fully refined slabs in bags)

Prices Effective Nov. 12

	New Orleans Export	N. Y. Domestic	N. Y. Export
Crude Scale:			
124-6 Yellow	2.85-3.00 (1)	.....	2.85-3.00 (1)
122-4 White	.....	2.85-3.00	2.85-3.00
124-6 White	2.85-3.25 (2)	2.85-3.00	2.85-3.00
Fully Refined:			
123-5	....	5.60	5.60 (2)
125-7	5.60 (1)	5.60	5.60
128-30	6.15 (1)	5.60–5.70 (i)	5.60
130-2	6.15 (1)	5.85 (i)	5.85
133-5	6.40 (1)	6.15 (i)	6.15
135-7	7.15 (1)	6.40 (i)	6.40
108-11 White Match	....	....	3.25 (i&j)

Naphtha

Prices Effective Nov. 12	V.M.&P. Naphtha	Mineral Spirits
Baltimore	9.50	8.00
New York Harbor	8.80 – 9.50	8.20 – 8.50
Philadelphia district	10.00	8.00 – 9.00
Boston	9.00	8.75 – 9.25
Providence	9.00	8.75 – 9.00
†Ohio points, delivered	8.75	*8.25

*This is on rubber solvent.

†Ohio prices are those of S. O. Ohio. Its prices for D.C. naphtha, special Varnolene, Varnolene and Sohio Solvent are same as for V.M.&P.

Pacific Export

(Quotations at seaboard, Los Angeles, cargo lots, except where otherwise noted.)

Prices Effective	Nov. 12	Nov. 4
375 e.p. blend, 70 oct.	4.50 – 5.625	4.50 – 5.625
390 e.p. blend, 68 oct.	4.375– 5.50	4.375– 5.50
390 e.p. blend, 66 oct.	4.375– 5.375	4.375– 5.375
400 e.p. blend, 65 oct. min.	4.25 – 5.25	4.25 – 5.25
U. S. Motor, under 65 octane	4.25 – 5.125	4.25 – 5.125
38-40 grav. w.w. kero., 150 fire point	4.50 – 5.00	4.50 – 5.00
41-43 grav., w.w. kero.	4.75 – 5.00	4.75 – 5.00
44 grav., w.w. kero.	5.00 – 5.50	5.00 – 5.50
Diesel fuel, 24 & above	$1.25 –$1.30	$1.25 –$1.30
Diesel fuel, under 24	$1.15 –$1.25	$1.15 –$1.25
30-34 grav. diesel (gas oil) Pac. Spec. 200	$1.25 –$1.35	$1.25 –$1.35
Grade C fuel, Pac. Spec. 400	$0.60 –$0.65	$0.60 –$0.65
In Ships' Bunkers, or deep tank lots:		
Diesel fuel, Pac. Spec. 200	$1.35 –$1.45	$1.35 –$1.45
Grade C fuel, Pac. Spec. 400	$0.60 –$0.75	$0.60 –$0.75

Pacific Export (Cont'd)

Prices Effective	Nov. 12	Nov. 4
Cased Goods: (Per case)		
U. S. M.	$1.35 –$1.45	$1.35 –$1.45
375-400 e.p. blend, 65 oct. & above	$1.50 –$1.60	$1.50 –$1.60
400 e.p. blend, under 65 oct.	$1.40 –$1.50	$1.40 –$1.50
40-43 grav. w.w. kero., 150 fire point	$1.30 –$1.40	$1.30 –$1.40
Kero., p.w.	$1.25 –$1.35	$1.25 –$1.35

Tanker Rates

(Approximate rates. Cents per bbl.)

Gulf-N. Atlantic: (not E. of N.Y.)	Last Paid	Owners Ask
Hvy. Crude & fuel, (10 to 19.9 gravity)	45.5	..
Light Crude, (30 grav. or Lighter)	40	..
Gasoline	48	..
Kerosine	51	..
No. 2 Fuel	54	..

Gulf Coast

(Prices for sales made or firm offers reliably reported for sales pending in cargoes FOB ship at Gulf, for minimum of 20,000 bbls. Prices are by refiners only to other refiners, export agents, or to large tanker terminal operators at the customary trade specifications noted.)

Prices Effective Nov. 12

Motor Gasoline Domestic	
Min. 80 oct., '39 Research, max. 2 cc. lead	4.00 – 5.00
60-62, Gravity, Max. 400 e.p.	
72-74 oct. leaded (ASTM)	3.75 – 4.75
70 oct. unleaded "	4.25
68 oct. " "	3.75 – 4.75
65 oct. " "	3.625– 4.625
60 oct. " "	3.625– 4.50
41-43 w.w. kerosine	3.875– 4.00
No. 2 fuel	3.25 – 3.75
Gas Oil—Less than ½ of 1% sulfur	
Below 43 diesel index	3.125– 3.25
43-47 " "	3.125– 3.375
48-52 " "	3.125– 3.625
53-57 " "	3.50
58 & above diesel index	3.75
Diesel Oil, ships' bunkers (ex-lighterage)	$1.50 –$1.70
Bunker C. " " "	$0.80 –$0.90
Bunker C, cargoes	$0.80 –$0.85

Motor Gasoline Export	
60-62 Gravity, Max. 400 e.p.	
72-74 oct. leaded (ASTM)	3.75 – 4.75
70 oct. unleaded "	4.25
68 oct. " "	3.75 – 4.75
65 oct. " "	3.625– 4.625
60 oct. " "	3.625– 4.50
61-63 Gravity, Max. 390 e.p.	
72-74 oct. leaded (ASTM)	4.25
60 oct. unleaded "	4.00
64-66 Gravity Max. 375 e.p.	
72-74 oct. leaded (ASTM)	4.25
60 oct. unleaded "	4.00
41-43 w.w. kerosine	3.875– 4.00
Gas Oil—Less than ½ of 1% sulfur	
Below 43 diesel index	3.125– 3.25
43-47 " "	3.125– 3.375
48-52 " "	3.125– 3.625
53-57 " "	3.50
58 & above diesel index	3.75

MID-CONTINENT LUBES

(At Gulf- in packages, FAS.; in bulk FOB terminals)

	Nov. 12 New Steel Drums	Bulk
200 vis. D. 210 brt. stock	25.50–25.80 (2)	19.80 (2)
150 vis. D 210 brt. stock 0-10 p.p.	21.50–21.80 (2)	15.80 (2)
10-25 p.p.	21.00 (1)	15.30 (1)
100 vis. D 210 brt. stock 0-10 p.p.	21.00 (1)	15.30 (1)
10-25 p.p.	20.50 (1)	14.80 (1)
200 vis. No. 3 col. neutral: 0-10 p.p.	17.00 (1)	11.30 (1)

SOUTH TEXAS LUBES

(Vis. at 100°, c. t. 0, blk exprt. shp., FOB terminals)

Unfiltered Pale Oils: Vis. Color	Nov. 12	Nov. 4
100 No. 3	6.00	6.00
200 No. 3	7.50	7.50
300 No. 3	8.00	8.00
500 No. 3½	9.00	9.00
750 No. 4	9.50	9.50
1200 No. 4	10.00 –11.00	10.00 –11.00
2000 No. 4	10.25	10.25
Red Oils: Vis. Color		
100 No. 5-6	6.00	6.00
200 No. 5-6	7.50	7.50
300 No. 5-6	8.00	8.00
500 No. 5-6	9.00	9.00
750 No. 5-6	9.50	9.50
1200 No. 5-6	10.00 –11.00	10.00 –11.00
2000 No. 5-6	10.25	10.25

(i) Shipments in bags or in bulk. (j) Shipment in tight barrels. (k) Some oil said to be of Mexican origin is being offered at 1c.

TANK WAGON PRICES

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes;** *they do, however, include inspection fees as shown in general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnotes. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes; for commercial consumer discounts, see NPN for Feb. 21, 1940.*

These prices in effect Nov. 11, 1940 as posted by principal marketing companies at their headquarters offices, but subject to later correction.

S. O. New Jersey

Esso (*Regular Grade*)

	Consumer Tank Car	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
*Atlantic City, N. J.	6.5	8.1	4.5	7.7
*Newark, N. J.	6.5	8.1	4.5	7.7
Annapolis, Md.	7.35	8.85	5.5	9.5
Baltimore, Md.	6.75	8.25	5.5	8.5
Cumberland, Md.	8.15	9.65	5.5	10
Washington, D. C.	7	8.5	3.5	9.5
Danville, Va.	7.95	10.45	6.5	11
Norfolk, Va.	6.75	9.25	6.5	10.5
Petersburg, Va.	7.05	9.55	6.5	11.2
Richmond, Va.	7.05	9.55	6.5	10.5
Roanoke, Va.	8.25	10.75	6.5	11
Charleston, W. Va.	7.55	10.05	6.5	12.6
Parkersburg, W. Va.	6.85	9.35	6.5	11.2
Wheeling, W. Va.	7.85	10.35	6.5	11.8
Charlotte, N. C.	8.9	8	7.5	9.8
Hickory, N. C.	9.45	10.95	7.5	10.3
Mt. Airy, N. C.	9.3	10.8	7.5	10.2
Raleigh, N. C.	8.65	8.5	7.5	9.5
Salisbury, N. C.	8.95	7.5	7.5	9.9
Charleston, S. C.	6.75	9.25	7.5	9.25
Columbia, S. C.	7.6	10.1	7.5	11.5
Spartanburg, S. C.	8.3	10.8	7.5	12.2

	Mineral Spirits T.W.	V.M.P.& T.W.
Newark, N. J.	11.5	15.5
Baltimore, Md.	15.5	....
Washington, D. C.	15	....

Fuel Oils—T.W.	No. 1	No. 2	No. 3
Atlantic City, N. J.	7.7	6.1	6.1
Newark	7.7	6.1	6.1
Annapolis, Md.	....	6	....
Baltimore	6.75	6	5.5
Washington, D. C.	7	6.25	6.25
Norfolk, Va.	7	6	6
Petersburg	7.25	6.25	....
Richmond	7.25	6.25	6.25
Charlotte, N. C.	8.8	7.25	....
Hickory	....	7.5	....
Raleigh	8.5	7	....
Charleston, S. C.	8	6.5	....
Columbia	8.7	7.2	....
Spartanburg	9.8	8	....

*Effective Sept. 19, 1940, minimum retail resale price of 10.4c posted thru New Jersey.

Discounts:

Esso gasoline—to undivided dealers, 0.5c off dealer t.w. price, thru territory, except New Jersey. While above posted prices continue at Atlantic City and Newark, dealers will pay net price of 7.5c per gal. for Esso; dealers having pumps marked only Esso, Esso Extra and Standard White gasoline will pay 7c per gal. for Esso.

Kerosine—1c off t.w. price for 25 gals. or more, under contract thru territory (Baltimore city contract not necessary) except no discount in state of New Jersey.

Naphthas—To buyers taking following quantities at one time: Newark, 2c per gal. on 200 gals. or more, less than 200 gals. 0.5c higher price; Baltimore, 2c off on 25 to 100 gals. and 3c on over 100 gals.; Washington, 2c off to contract buyers.

Socony-Vacuum Oil Co., Inc.

Socony Mobilgas (*Regular Grade*)††

	Com. T.C.	Com. Cons. T.W.	Div. Dlr. T.W.	Gasoline Taxes	Kerosine T.W.
New York City:					
Manhattan & Bronx	6.4	6.2	7	*5.5	7.9
Kings & Queens	6.4	6.2	7	*5.5	7.9
Richmond	6.4	6.2	7.2	*5.5	7.9
Albany, N. Y.	6.3	6.3	7.3	5.5	7.6
Binghamton, N. Y.	7.8	7.8	8.8	5.5	9.1
Buffalo, N. Y.	6.9	6.9	7.9	5.5	7.5
Jamestown, N. Y.	6.7	6.7	7.6	5.5	7.4
Plattsburg, N. Y.	6.5	7.2	8.2	5.5	8.2
Rochester, N. Y.	7.3	7.3	8.3	5.5	8.1
Syracuse, N. Y.	7	7	6.2	5.5	8.5
Bridgeport, Conn.	6.2	6.6	6.5	4.5	7.8
Danbury, Conn.	6.7	6.8	7.8	4.5	8.3
Hartford, Conn.	6.5	6.8	7	4.5	7.5
New Haven, Conn.	6.2	6.3	6.6	4.5	7.3
Bangor, Me.	6.1	7	8	5.5	8.1
Portland, Me.	5.7	6.6	7.6	5.5	8
Boston, Mass.	5.7	6.1	6.6	4.5	8
Concord, N. H.	6.9	7.5	8.5	5.5	8.6
Lancaster, N. H.	7.7	8.5	9.5	5.5	9.6
Manchester, N. H.	6.8	7.4	7.1	5.5	8.8
Providence, R. I.	5.7	6.2	7.2	4.5	8
Burlington, Vt.	6.8	7.2	6.8	5.5	8.2
Rutland, Vt.	6.9	7.4	6.8	5.5	8.6

	Mineral Spirits T.W.	V.M.&P. T.W.
Buffalo, N. Y.	9.4	10.1
†New York City	8.2	8.8
Rochester, N. Y.	10.2	10.9
Syracuse, N. Y.	11.1	11.8
Boston, Mass.	11	11
Bridgeport, Conn.	11.5	12
Hartford, Conn.	11	11.5
Providence, R. I.	11	12

Fuel Oils—T.W.	Mobilheat & Mobilheat Heavy
New York City	6.4
Albany, N. Y.	6.3
Rochester, N. Y.	6.9
Boston, Mass.	6.4
Bangor, Me.	6.8
Manchester, N. H.	7.1
Burlington, Vt.	7
Hartford, Conn.	6.5
New Haven, Conn.	6.5
Providence, R. I.	6.3

*Plus 2% city sales tax computed at time of each sale.

†Prices apply to consumers only in quantities over 1000 gals. annually; for quantities under 1000 gals. annually, add 0.5c per gal.

††Same prices apply for No. 1 fuel.

Discounts: Gasoline—To undivided dealers, 0.5c less than divided dealer t.w.

Atlantic Refining

Atlantic White Flash Gasoline (*Regular Grade*)

	Commercial T.C.	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
Philadelphia, Pa.	7	8	5.5	10
Pittsburgh	7.5	9.5	5.5	10.5
Allentown	7.5	9	5.5	10.5
Erie	7	9.5	5.5	10
Scranton	6.4	6.9	5.5	10.5
Altoona	7.5	9.5	5.5	10.5
Emporium	7.5	9.5	5.5	10.5
Indiana	7.5	9.5	5.5	10.5
Uniontown	7.5	9.5	5.5	10.5
Harrisburg	7.5	9	5.5	10.5
Williamsport	7.5	9	5.5	10
Dover, Del.	....	8.5	5.5	10.5
Wilmington	....	9.35	5.5	10
Boston, Mass.	....	6.6	4.5	8
Springfield, Mass.	....	6.5	4.5	8.7
Worcester, Mass.	....	7	4.5	8.1
Fall River, Mass.	....	7.2	4.5	8.2
Hartford, Conn.	....	7	4.5	8.2
New Haven, Conn.	....	6.6	4.5	8.2
Providence, R. I.	....	7.2	4.5	8.2
Atlantic City, N. J.	....	7.5	4.5	7.7
Camden, N. J.	....	7.5	4.5	7.7
Trenton, N. J.	....	7.3	4.5	7.7
Annapolis, Md.	....	8.85	5.5	9.5
Baltimore, Md.	....	8.25	5.5	8.5
Hagerstown, Md.	....	9.35	5.5	10
Richmond, Va.	....	10.05	6.5	10.5
Wilmington, N. C.	....	9.85	7.5	8.8
Brunswick, Ga.	....	8	7.5	*9
Jacksonville, Fla.	....	7.5	8.5	10

	Mineral Spirits T.W.†	V.M.&P. T.W.†
Philadelphia, Pa.	12	14.5
Lancaster, Pa.	13.5	16
Pittsburgh, Pa.	14.5	14.5

Fuel Oils—T.W.	1	2	3	5	6
Phila., Pa.	8	6.5	6.5	4.25	3.50
Allentown, Pa.	8.5	6.5	6.5	....	....
Wilmington, Del.	8.00	6.5	6.5	....	....
Springfield, Mass.	8.7	7	7	....	....
Worcester, Mass.	8.1	6.8	6.8	....	....
Hartford, Conn.	8.2	6.7	6.7	....	....

*Does not include 1c Georgia kerosine tax.

†Mineral Spirits prices also apply to Stoddard Solvent; V.M.&P. prices also apply to Light Cleaners Naphtha.

Discounts:

‡Gasoline—to undivided dealers, 0.5c off dealer t.w., except Georgia & Florida dealer t.w. and undivided dealer t.w. prices are same.

Kerosine—Thru Penna. & Delaware, 2c off t.w. price on t.w. deliveries of 25 gals. or more at one time.

Naphthas—Philadelphia, 200 gals. or more at one time, 2c off, Lancaster, contract buyers taking 1000 gals. or more per year, one drum up, 2c off; non-contract buyers 200 gals. or more at one time, 2c off. Pittsburgh, 500 gals. or more at one time, 2c off.

S. O. Ohio††

***Sohio X-70 Gasoline (*Regular Grade*)**

	Consumer T.W.	**Resellers	‡S.S.	Gasoline Taxes	†Kerosine T.W.
Ohio, Statewide	10.5	9	12.5	5.5	8
Akron	10.5	7.5	9.5	5.5	8
Cincinnati	10.5	7.5	10	5.5	8
Cleveland	10.5	8	11	5.5	8
Columbus	10.5	8	11	5.5	8
Dayton	10.5	7.5	10	5.5	8
Marietta	10.5	8	10.5	5.5	8
Portsmouth	10.5	9	12.5	5.5	8
Toledo	10.5	7.5	10	5.5	8
Youngstown	10.5	8	11	5.5	7.5

Esso Aviation Gasoline—Thru Ohio

	Consumer T.W.	Gasoline Taxes
74 octane	15.5	5.5
80 octane	16.5	5.5
87 octane	17.5	5.5

†Naphthas—Statewide	T.W.
S.R. Solvent	12.75
D.C. Naphtha	13.25
V.M.&P. Naphtha	13.25
Varnolene	13.25
Sohio Solvent	13.25

Fuel Oils—T.W.	No. 1	No. 2	No. 3	No. 4
Ohio, Statewide	8.0	8.0	7.5	....
Toledo	7.5	7.5	7.0	....
Cleveland	9.5	9.5	9.0	6.75

*Renown (third-grade) prices are same as X-70 unless otherwise noted.

**Except authorized agents.

†Kerosine prices are ex 1c state tax. Naphtha prices are ex 1.5c federal & 4c state tax.

‡Prices at company-operated stations.

††Statewide prices are subject to exceptions other than those shown.

Discounts:

Esso aviation—on contract to hangar operators and resellers, 2c off consumer t.w.

Fuel Oils—Statewide and Toledo prices are for t.w. deliveries of less than 50 gals.; t.w. and drum deliveries of over 50 gals. are 0.5c less. Cleveland Nos. 1, 2, and 3 prices are for bulk deliveries of 5 to 99 gals.; 100 gals. and over are 2c less. Cleveland No. 4 price is for full compartment hose dump only.

Naphthas—to contract consumers off t.w. prices; 300 to 999 gals., 0.5c; 1000 to 2499 gals., 0.75c; 2500 to 4999 gals., 1c; 5000 or more gals., 1.5c.

S. O. Kentucky

Crown Gasoline (*Regular*)
Standard (*Third Grade*)

	†Net Dealer Crown	Standard	Gasoline Taxes	Kerosine T.W.
Covington, Ky.	7	6.5	6.5	9
Lexington, Ky.	9	7	6.5	9
Louisville, Ky.	8.5	6.5	6.5	8.5
Paducah, Ky.	7.5	7	6.5	8.5
Jackson, Miss.	8.5	7.5	7.5	*8.5
Vicksburg, Miss.	8.5	7.5	7.5	*8
Birmingham, Ala.	9	8	*8.5	9
Mobile, Ala.	6	5	**9.5	8
Montgomery, Ala.	9	7.5	**9.5	*9
Atlanta, Ga.	7.5	6.5	7.5	*7
Augusta, Ga.	9.5	8.5	7.5	*8.5
Macon, Ga.	7.5	6.5	7.5	*8
Savannah, Ga.	8	7	7.5	*8
Jacksonville, Fla.	7.5	6.5	8.5	8
Miami, Fla.	7.5	6.5	8.5	8
Pensacola, Fla.	8	7	**9.5	8
Tampa, Fla.	7.5	6.5	8.5	8

*Taxes: In tax column are included these city and county gasoline taxes: Mobile, 2c city; Birmingham, 1c city; Montgomery, 1c city and 1c county; Pensacola, 1c city. Georgia and Montgomery, Ala. have 1c kerosine tax, Mississippi 0.5c, not included in above prices.

†Consumer t.w. prices are same as net dealer prices.

S. O. Indiana

Red Crown (*Regular Grade*)
Stanolind (*Third Grade*)

	Red Dealer Prices Crown Cons. T.W.	Red Crown	Stanolind	Gasoline Taxes	Kerosine T.W.
Chicago, Ill.	11.1	8.1	6.4	4.5	10
Decatur, Ill.	10.1	8.6	6.2	4.5	9.5
Joliet, Ill.	11.1	9.6	6.7	4.5	10
Peoria, Ill.	11.1	8.7	8.1	4.5	10
Quincy, Ill.	10.9	9.4	6.2	4.5	9.8
Indianapolis, Ind.	11.3	9.3	8.9	5.5	*10
Evansville, Ind.	11.1	9.6	8	5.5	*9.8
South Bend, Ind.	11.3	9.8	8.8	5.5	*10
Detroit, Mich.	9.6	8.1	7.1	4.5	7.6
Grand Rapids, Mich.	9.8	8.3	8	4.5	9.1
Saginaw, Mich.	10.4	8.9	8.4	4.5	9.1
Green Bay, Wis.	11.9	10.4	8.9	5.5	10.3
Milwaukee, Wis.	11.3	9.8	9.3	5.5	10.2
La Crosse, Wis.	11.5	10	9.5	5.5	10.4
Minneapolis-St. Paul	11.5	9.7	7.3	4.5	10.4
Duluth, Minn.	11.9	10.4	9.9	4.5	10.8
Mankato, Minn.	11.5	10	8.5	4.5	9
Des Moines, Ia.	10.9	9.4	7.9	4.5	*9.8
Davenport, Ia.	11.1	9.6	8.1	4.5	*10
Mason City, Ia.	11.3	9.8	6.9	4.5	*10.2
St. Louis, Mo.	10.7	8.7	7	*4.5	9
Kansas City, Mo.	10.3	7.3	6.3	*4.5	8
St. Joseph, Mo.	10.4	8.5	7.5	*4.5	7.9
Fargo, N. D.	12.7	11.2	9	5.5	11.6
Huron, S. D.	12	10.5	10	5.5	10.9
Wichita, Kans.	9.3	7.8	5.5	4.5	7

(Continued on next page)

TANK WAGON PRICES

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes;** *they do, however, include inspection fees as shown in general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnotes. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes; for commercial consumer discounts, see NPN for Feb. 21, 1940.*

These prices in effect Nov. 11, 1940 as posted by principal marketing companies at their headquarters offices, but subject to later correction.

S. O. Indiana (Cont'd)

Stanavo Aviation 73 Octane

Chicago, Ill.	14.9	
Detroit, Mich.	16.5	4.5
Milwaukee, Wis.	15.1	5.5
Minneapolis, Minn.	15.3	4.5
St. Louis, Mo.	14.5	3.5
Kansas City, Mo.	14.2	*4.5
Fargo, N. D.	16.5	5.5
Huron, S. D.	15.8	5.5

	Oleum Spirits	V.M.&P. Naphtha	Stani-sol	*Taxes
	(Prices are base prices before discounts)			
Chicago	12.7	13	12.4	4.5
Detroit	15.2	14.2	15.7	4.5
K. C., Mo.	12.9	13.9	13.4	1.5
St. Louis	13.2	14.2	12.4	1.5
Milwaukee	13.8	14.8	14.3	5.5
Minnep'ls	14	15	12.7	4.5

†Fuel Oils—T.W.	No. 1 Fuel	Stanolex Furnace
Chicago	**6.75	6.75
Indianapolis	....	*7.5
Detroit	....	6.6
Milwaukee	8.2	7.7
Minneapolis	7.5	7.5
St. Louis	7.0	6.50
Kansas City	6.8	6.8

*Taxes: In gasoline tax column are included these city taxes—Kansas City, St. Joseph, and St. Louis, 1c. Indiana kerosine and fuel oil prices are ex 4c state tax: Iowa kerosine prices are ex 3c state tax. In naphtha tax column are included 1c federal tax and state taxes.

†Prices for small-lot deliveries range up to 2c higher than above prices.

**For 400 gals. & over; 150 to 399 gals., 7.25c; 100 to 149 gals., 7.5c; 1 to 99 gals., 8.5c.

S. O. Nebraska

Standard Red Crown Gasoline (*Regular Grade*)

	T.W.	Dealer	Gasoline Taxes	Kerosine T.W.
Omaha	10.9	9.4	6.5	9.5
McCook	10.5	7.9	6.5	9
Norfolk	11	8.9	6.5	9.9
North Platte	11.3	9	6.5	10.2
Scottsbluff	10.9	8	6.5	10.8

S. O. Louisiana

Esso (*Regular Grade*)

	Consumer Tank Car	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
Little Rock, Ark.	6.75	8.5	8	10
Alexandria, La.	6.25	8.75	8.5	*9.5
Baton Rouge, La.	6.25	8.75	8.5	*9.5
New Orleans, La.	5.75	8.25	8.5	*9
Lake Charles, La.	6.25	8.75	8.5	*9
Shreveport, La.	5.5	8	8.5	*9
Lafayette, La.	6.5	9	8.5	*9
Bristol, Tenn.	9.75	10.25	8.5	12
Chattanooga, Tenn.	9	8.85	8.5	12
Knoxville, Tenn.	9.5	11.5	8.5	12.5
Memphis, Tenn.	7.5	9.5	8.5	11
Nashville, Tenn.	8.5	9	8.5	11

*New Orleans kerosine price is ex 1c parish tax, and all Louisiana kerosine prices are ex 1c state tax.

Discounts:

Esso gasoline—to undivided dealers, 0.5c off dealer t.w.

Humble Oil & Refining Co.

Humble Motor Fuel (*Regular Grade*)

	Tank Truck	Retail	Gasoline Taxes	Kerosine T.W.
Dallas, Tex.	6	10	5.5	6
Ft. Worth, Tex.	6	10	5.5	7
Houston, Tex.	7	11	5.5	8
San Antonio, Tex.	7	11	5.5	8

Thriftane

(Leaded, 67 Octane, Purple Gasoline

Dallas	5	8	5.5
Ft. Worth	5	8	5.5
Houston	5	8	5.5
San Antonio	5	8	5.5

74 Octane Aviation Gasoline, Clear

	Tank Car
FOB Baytown, Tex.	8.5

*To all classes of dealers & consumers.

The Texas Co.

	Gasoline—Dealer Fire-Chief (*Regular*)	T.W. Indian (*3rd Grade*)	Gasoline Taxes
Dallas, Tex.	6	5	5.5
Ft. Worth, Tex.	6	5	5.5
Wichita Falls, Tex.	7	5	5.5
Amarillo, Tex.	7	5	5.5
Tyler, Tex.	7	5	5.5
El Paso, Tex.	9	8	5.5
San Angelo, Tex.	7	5	5.5
Waco, Tex.	6.5	4.5	5.5
Austin, Tex.	7	5	5.5
Houston, Tex.	7	5	5.5
San Antonio, Tex.	7	5	5.5
Port Arthur, Tex.	7	5	5.5

Continental Oil

	Conoco Bronz-z-z (*Regular*)	Demand (*3rd Grade*) T.W.	Gasoline Taxes	Kerosine T.W.
Denver, Col.	9	8	5.5	10.5
Grand Junction, Col.	11	10	5.5	12.5
Pueblo, Col.	10	8	5.5	9
Casper, Wyo.	11	10	5.5	11.5
Cheyenne, Wyo.	9	8	5.5	11
Billings, Mont.	10	9	6.5	12
Butte, Mont.	9	8	6.5	13
Great Falls, Mont.	11	9.5	6.5	12
Helena, Mont.	9	8	6.5	12.5
Salt Lake City, Utah	10.5	9.5	5.5	14
Boise, Ida.	*12.1	11.1	6.5	16
Twin Falls, Ida.	*13.1	*12.1	6.5	16.5
Albuquerque, N. M.	9	8	*7	9.5
Roswell, N. M.	7	6	*7	8
Santa Fe, N. M.	9.5	8.5	*7.5	9.5
Ft. Smith, Ark.	8	6.75	5.5	6.5
Little Rock, Ark.	8	5.5	8	8
Texarkana, Ark.	8	5.5	5.5	6
Muskogee, Okla.	8	7	5.5	7
Oklahoma City, Okla.	6	5.5	5.5	6.5
Tulsa, Okla.	7	6	5.5	6

Conoco Special Gasoline (Aviation)

	T.W.	Gasoline Taxes
Denver, Colo.	13.5	5.5
Cheyenne, Wyo.	15.5	5.5
Helena, Mont.	15.5	6.5
Salt Lake City, Utah	18	5.5
Albuquerque, N. M.	14	*7

*Taxes: In gasoline tax column are included these city taxes—Albuquerque and Roswell, 0.5c; Santa Fe 1c. Idaho prices include 0.1c to cover 1-mill tax for toll bridges.

S. O. California

Standard Gasoline (*Regular Grade*)

	Tank Truck	Retail	Gasoline Taxes	Kerosine T.W
San Francisco, Cal.	12	13	4.5	11.5
Los Angeles, Cal.	11.5	12.5	4.5	10
Fresno, Cal.	13	14	4.5	12.5
Phoenix, Ariz.	14	15	6.5	*12.5
Reno, Nev.	14	15	5.5	13.5
Portland, Ore.	12.5	13.5	6.5	13.5
Seattle, Wash.	12.5	13.5	6.5	13.5
Spokane, Wash.	14	15	6.5	16.5
Tacoma, Wash.	12.5	13.5	6.5	13.5

Flight Gasoline (*Third Grade*)

San Francisco, Cal.	10	11	4.5	....
Los Angeles, Cal.	9.5	10.5	4.5	....
Fresno, Cal.	11	12	4.5	....
Reno, Nev.	12	13	5.5	....
Phoenix, Ariz.	11	12	6.5	....
Portland, Ore.	10.5	11.5	6.5	....
Seattle, Wash.	10.5	11.5	6.5	....
Spokane, Wash.	12	13	6.5	....
Tacoma, Wash.	10.5	11.5	6.5	....

Stanavo Aviation Gasoline

Phoenix, Ariz.	17.5	..	6.5	....
Los Angeles, Cal.	15	..	4.5	....
San Francisco, Cal.	15.5	..	4.5	....
Reno, Nev.	17.5	..	5.5	....
Portland, Ore.	16	..	6.5	....
Seattle, Wash.	16	..	6.5	....
Spokane, Wash.	19	..	6.5	....

*Taxes: Arizona kerosine prices are ex 5c state tax.

Discounts:

To 100% dealers—3c off t.w. on Standard and Stanavo Aviation; 2c off t.w. on Flight.

Canada

PRICES OF IMPERIAL OIL LTD.

Per Imperial Gallon, which is 1.2 U. S. Gallons

	3-Star Imperial Gasoline (*Regular Grade*) T.W.	Gasoline Taxes	Kerosine T.W.
Hamilton, Ont.	16.5	8	17
Toronto, Ont.	16.5	8	17
Brandon, Man.	21	7	22.50
Winnipeg, Man.	20.5	7	22.5
Regina, Sask.	18	7	20
Saskatoon, Sask.	21	7	23
Edmonton, Alta.	18	7	20
Calgary, Alta.	16	7	18
Vancouver, B. C.	16	7	23
Montreal, Que.	16	8	16.5
St. John, N. B.	14.50	10	18
Halifax, N. S.	14.50	10	18

Discounts: Gasoline—Maritime Provinces—undivided & divided dealers, t.w. price; British Columbia—undivided and divided dealers, 2c off t.w. price; balance of territory—undivided dealers, 1c off t.w. price, divided dealers, t.w. price.

Price Changes

(These changes have been made in price tables)

S. O. New Jersey—Esso:

Corrections: Nov. 4 reduction in Wheeling dealer t. w. was 0.4c to 10.35c instead of 0.5c to 10.25c as reported in NPN of Nov. 6. Charlotte dealer t. w. was cut 0.4c to 8c, Nov. 4.

Atlantic Refining—White Flash:

Wilmington dealer t. w. up 1.35c, Nov. 4.

Atlantic Refining—Kerosine:

Atlantic City, Camden and Trenton t. w. up 0.3c, Nov. 1.

S. O. Indiana—Red Crown:

Grand Rapids consumer t. w. up 0.3c, Nov. 4; up 1.3c, Nov. 7.

Grand Rapids dealer up 1.3c, Nov. 7.

S. O. Indiana—Stanolind:

Grand Rapids dealer up 1c, Nov. 7.

S. O. Indiana—Kerosine:

Grand Rapids t. w. up 0.1c, Sept. 3.

S. O. Nebraska—Red Crown:

Scottsbluff dealer cut 0.5c, Oct. 23.

S. O. Louisiana—Esso:

Nashville dealer t. w. up 1c, Nov. 6.

Corrections: Shreveport consumer t. c. and dealer t. w. and Knoxville dealer t. w. were not included in Nov. 4 reduction. Nashville consumer t. c. reduction Nov. 4 was 0.5c instead of 0.25c.

S. O. Louisiana—Kerosine:

Shreveport t. w. up 1c, May 1.

Continental Oil—Bronz-z-z and Demand:

Ft. Smith t. w. up 1c, Nov. 4.

CRUDE OIL PRICES

Prices in $ per bbl. of 42 U. S. gals. at the well. A. P. I. gravity. Prices are effective as of 7 a. m. of dates as given

EASTERN & CENTRAL STATES FIELDS

PENNSYLVANIA GRADE

Posted by Jos. Seep Purch. Agency (Nov. 12, 1940)

Bradford-Allegany $2.00
Southwest Penna $1.65
Eureka (West Va.) $1.59
Corning, O. (Nov. 4, 1939) $1.12

Posted by Tide Water Assoc. Oil Co. (Nov. 12, 1940)

Bradford-Allegany $2.00

Posted by The Pennzoil Co. (Nov. 12, 1940)

National Transit $1.93*

Posted by Valvoline Pipe Lines (Aug. 28, 1940)

Bradford (Elk & McKean Counties, Pa.) $1.85
Warren, Forest, Venango, Clairon & Butler Counties, Pa $1.78
Allegheny, Beaver, Washington & Greene Counties, Pa $1.50
West Virginia $1.44
South Eastern Ohio $1.40

*Applies to Cochran, Franklin, Hamilton & Doolittle districts; prices in other lower districts range downt o $1.88 per bbl. at well.

MICHIGAN

Posted by Pure Oil Co. (Aug. 24, 1940)

Midland, Midland County $1.12
Sherman $1.07
Clare-Freeman $1.07

Posted by Simrall Corp. (Aug. 24, 1940)

Crystal, Greendale, Porter, Vernon and Wise $1.12
Beaverton, Buckeye, Bentley, Edenville $1.10
Freeman and Redding $1.07
Arenac $0.92
West Branch $0.92

Posted by Sohio Corp. (Michigan Division)

Allegan & Kent Counties (Aug. 24, 1940) $1.18
Van Buren County (Nov. 1, 1940) $1.18

Posted by Bay Pipe Line Corp. (Aug. 24, 1940)

Bentley and Buckeye $1.10
Saginaw and Wise..$1.12 Clare $0.81

ILLINOIS-INDIANA-KENTUCKY

Posted by Sohio Corp.

Illinois Basin, including Griffin pool (Aug. 21, '40) $1.15
Carmi, Storms, Ill. area (Nov. 1, '40) 1.05
Birk City, Ky. area (Aug. 21, '40) 1.05
Corydon, Ky. area, Henderson (Aug. 21, '40) 1.05

Posted by Ohio Oil Co.

Illinois Basin (Aug. 21, '40) $1.15
Illinois & Western Indiana (Aug. 23, '40) 1.00

Posted by Carter Oil Co. (Aug. 21, '40)

Louden, Fayette Co. Ill. $1.15

Posted by Mohawk Oil Lines, Inc. (Aug. 21, '40)

So. Illinois heavy..$1.05 Light $1.15

Posted by Ashland Oil & Transp. Co.

Somerset oil in Ashland Lines, Ky.:
(Aug. 21, '40)

Big Sandy River...$1.12 Kentucky River...$1.20

Posted by Owensboro-Ashland Co.

Owensboro, Ky. area (Aug. 21, '40) $1.10

MID-CONTINENT

OKLAHOMA-KANSAS-NORTH TEXAS

(See below for companies posting and effective dates)

Gravity	Schedule No. 1	Schedule No. 2	Schedule No. 3	Schedule No. 4	Schedule No. 5
Below 21	$0.70	$0.60	....	....	$0.63
21-21.9	.72	.63	....	....	.65
22-22.9	.74	.66	....	....	.67
23-23.9	.76	.69	....	....	.69
24-24.9	.78	.72	....	....	.71
25-25.9	.80	.75	....	$0.58	.73
26-26.9	.82	.78	....	.63	.75
27-27.9	.84	.81	....	.68	.77
28-28.9	.86	.84	$0.86	.73	.79
29-29.9	.88	.87	.88	.78	.81
30-30.9	.90	.90	.90	.82	.83
31-31.9	.92	.92	.92	.86	.85
32-32.9	.94	.94	.94	.90	.87
33-33.9	.96	.96	.96	.96	.89
34-34.9	.98	.98	.98	.98	.91
35-35.9	1.00	1.00	1.00	1.00	.93
36-36.9	1.02	1.02	1.02	1.02	.95
37-37.9	1.04	1.04	1.04	1.04	.97
38-38.9	1.06	1.06	1.06	1.06	.99
39-39.9	1.08	1.08	1.08	1.08	1.01
40 & above	1.10	1.10	1.10	1.10	1.03

Above schedules posted by:

No. 1: S. O. Indiana Oct. 17, '38 in Okla. & Kans.

No. 2: Carter Oct. 13, '38 in Okla.; Magnolia Oct. 12, '38 in Okla.; Shell Oct. 22, '38 in Okla. & Kans.

No. 3: Continental Oct. 11, '38 in Okla. & Kans. with lowest grade Below 29; Texas Co. Oct. 12, '38 in Okla. & Kans.

No. 4: Sinclair-Prairie Aug. 31, '39 in Okla. & Kans.

No. 5: Stanolind Sept. 1, '40 in N. Texas; Continental Oct. 11, '38 in N. Texas; Texas Co. Oct. 12, '38 in N. & N. Central Texas; Magnolia Dec. 3, '38 in N. & N. Central Texas; Sinclair-Prairie July 16, '40 in Mexia & N. Central Texas. Texas Co.'s lowest grade is 28-28.9 at $0.79; Continental, Magnolia and Sinclair-Prairie postings begin with Below 29 at $0.79.

TEXAS & NEW MEXICO FIELDS

Posted by Humble Oil & Refining Co. (Oct. 2, '39)

Gravity	West Central Texas	East Central Texas	Gray County	Carson-Hutchinson Counties	Tomball, etc.	W. Texas & N. Mexico	Texas Gulf Coast & Mirando	Anahuac-Dickinson	Refugio
Below 20	....	....	....	....	....	$0.53	$0.86	$0.81	$0.91
20-20.9	....	....	....	....	....	.55	.88	.83	.93
21-21.9	....	....	....	....	....	.57	.90	.85	.95
22-22.9	....	....	....	....	$0.95	.59	.92	.87	.97
23-23.9	....	$0.78	....	....	.97	.61	.94	.89	.99
24-24.9	$0.71	.80	....	....	.99	.63	.96	.91	1.01
25-25.9	.73	.82	....	....	1.01	.65	.98	.93	1.03
26-26.9	.75	.84	....	....	1.03	.67	1.00	.95	1.05
27-27.9	.77	.86	....	....	1.05	.69	1.02	.97	1.07
28-28.9	.79	.88	$0.72	$0.67	1.07	.71	1.04	.99	1.09
29-29.9	.81	.90	.74	.69	1.09	.73	1.06	1.01	1.11
30-30.9	.83	.92	.76	.71	1.11	.75	1.08	1.03	1.13
31-31.9	.85	.94	.78	.73	1.13	.77	1.10	1.05	1.15
32-32.9	.87	.96	.80	.75	1.15	.79	1.12	1.07	1.17
33-33.9	.89	.98	.82	.77	1.17	.81	1.14	1.09	1.19
34-34.9	.91	1.00	.84	.79	1.19	.83	1.16	1.11	1.21
35-35.9	.93	1.02	.86	.81	1.21	.85	1.18	1.13	1.23
36-36.9	.95	1.04	.88	.83	1.23	.87	1.20	1.15	1.25
37-37.9	.97	1.06	.90	.85	1.25	.89	1.22	1.17	1.27
38-38.9	.99	1.08	.92	.87	1.27	.91	1.24	1.19	1.29
39-39.9	1.01	1.10	.94	.89	1.29	.93	1.26	1.21	1.31
40 & above	1.03	1.12	.96	.91	1.31	.95	1.28	1.23	1.33

W. Central Tex. includes crudes purchased in Brown, Callahan, Coleman, Comanche, Eastland, Fisher, Haskell, Jones, Shackelford, Stephens, Throckmorton & Young Cos., Tex.

E. Central Tex. includes crudes purchased in Anderson, Cherokee, Limestone & Navarro Cos., Tex.

W. Tex. & N. Mex. includes crudes purchased in Andrews, Crane, Crockett, Ector, Gaines, Glasscock, Howard, Reagan, Upton, Winkler & Yoakum Cos., Tex. & Lea Co., N. Mex.

Tex. Gulf Coast includes crudes purchased in Goose Creek, Sugarland, Thompsons, Mykawa, Amelia, Webster & Clear Lake fields.

Anahuac-Dickinson includes crudes purchased in Gillock, Cedar Point, Fairbanks, Turtle Bay, Hull, Pierce Junction & Raccoon Bend (Shallow Sand) fields.

Refugio includes crudes purchased in Saxet, East White Point, Greta, O'Connor-McFadden, Taft, Plymouth & Tom O'Connor fields.

Mirando includes crudes purchased in Duval, Jim Hogg, Webb & Zapata Cos., Tex. & in Heyser & Placedo fields

Postings for Raccoon Bend (Deep Sand) & Satsuma crudes are same as for Tomball.

East Texas $1.10
Van ..... .93
Pecos ..... .78
Talco $0.65
Conroe 1.27
Hardin 1.10
Flour Bluff & Jim Wells Cos. $1.23
Salt Flat, Darst Creek, Hilbig, Carroll, Clark & Zoboroski ..... .96

MAGNOLIA PETROLEUM CO.

Gray, Carson & Hutchinson Cos., Tex.—Dec. 3, '38—same as Humble.

Tomball, Tex.—Dec. 3, '38—same as Humble.

West Texas—Oct. 12, '38, in Crane, Glasscock, Howard, Mitchell, Upton & Winkler Cos. — same as Humble except Magnolia begins with Below 25 at $0.63.

N. Mexico—Oct. 15, '39, in Lea Co. — same as Humble except Magnolia begins with Below 25 at $0.63 and ends with 36 & above at $0.87.

Mirando, Tex.—Oct. 2, '39—same as Humble.

Beaumont, Tex.—Oct. 2, '39—same as Humble Texas Gulf Coast.

Cass & Panola Cos., Tex.—Oct. 12, '38—Below 25 grav. oil at $0.73, plus 2c per degree of gravity to top of 40 & above at $1.05.

Following Tex. postings Oct. 12, '38:

East Texas $1.10
Darst Creek ..... .96
Luling ..... .87
Lytton Springs ..... .99
Cleveland (Liberty Co.) $1.14
Hardin (Liberty Co.) 1.02

SINCLAIR-PRAIRIE OIL MARKETING CO.

Gray, Carson & Hutchinson Cos., Tex.—
Aug. 31, '39—same as Humble.

West Texas & Lea Co., N. Mex.—Aug. 31, '39—same as Humble, except Sinclair begins with Below 25 at $0.63 and ends with 36 & above at $0.87.

Texas Gulf Coast—Oct. 3, '39—same as Humble.

East Texas (Oct. 2, '39) $1.10
Eddy Co., N. Mex. (Aug. 31, '39) .. .77
Long Lake, in Anderson, Leon & Freestone Cos., Tex. (Jan. 20, '40) $1.08

STANOLIND OIL PURCHASING CO.

Tomball, Tex.—Aug. 29, '39—same as Humble except Stanolind begins with Below 29 at $1.07.

Texas Gulf Coast—Oct. 3, '39, in Clinton field—same as Humble Texas Gulf Coast except Stanolind begins with Below 21 at $0.88.

West Beaumont, Jefferson Co., Tex.—Oct. 2, '39—same as Humble Texas Gulf Coast.

THE TEXAS CO.

(Effective Oct. 2, '39)

Panhandle, Tex.—Sweet crude same as Humble's Gray Co. except Texaco begins with 34-34.9 at $0.84. Sour crude same as Humble's Carson & Hutchinson Cos. except Texaco begins with 34-34.9 at $0.79.

West Texas & Lea Co., N. Mex.—Same as Humble except Texaco begins with Below 26 at $0.65 and ends with 36 & above at $0.87.

Texas Gulf Coast—Same as Humble except Texaco ends with 34 & above at $1.16.

Mirando-Duval, Tex.—Same as Humble except Texaco ends with 28 & above at $1.04.

Refugio, Tex.—Same as Humble except Texaco ends with 28 & above at $1.09.

Following Tex. postings Oct. 12, '38:

East Texas $1.10
Darst Creek ..... .96
Cass Co. $1.05
Conroe 1.27

SHELL OIL CO., INC.

West Texas & Lea Co., N. Mex.—Aug. 29, '39, & Yoakum Co., Tex. Sept. 1, '39—same as Humble except Shell ends with 36 & above at $0.87.

Fisher Co., Tex.—Aug. 29, '39—Below 25 grav. at $0.68, plus 2c per degree of gravity up to 40 & above at $1.00.

Following Tex. postings Oct. 5, '39:
East Texas $1.10
Livingston area, Polk Co. 1.10

Following Tex. postings Aug. 29, '39:
Pecos Co., except Yates Shallow pool $0.78
Pecos Co., Yates Shallow pool ..... .65

CONTINENTAL OIL CO.

Eddy Co., N. Mex.—Apr. 22, '40—Begins with 28-28.9 at $0.61, plus 2c per degree gravity up to 40 & above at $0.85.

Mirando, Tex.—Oct. 2, '39—same as Humble.

Refugio, Tex.—Oct. 2, '39—same as Humble.

PAN AMERICAN PIPE LINE CO.

Hastings & So. Houston, Tex. crudes—Oct. 1, '40—same as Humble Texas Gulf Coast except Pan Am. begins with Below 21 at $0.88.

Cayuga, Anderson Co., Tex.—Oct. 2, '39—$0.78.

CRUDE OIL PRICES *(Continued from preceding page)*

CALIFORNIA *Posted by Standard Oil of California*

All gravities above those quoted take highest price offered in the field. Prices effective Feb. 1, 1940

Gravity	Signal Hill (Long Beach) and others*	Seal Beach	Huntington Beach	Inglewood	Playa Del Rey	Olinda Brea Canon	Athens-Rosecrans	Torrance	Richfield	Whittier East Coyote (La Habra)	Montebello	West Coyote Hills	Santa Fe Springs	Greeley Canal	Colea Levee Richfield Western	Mountain View and others**	Elk Hills	Buena Vista Hills, Midway-Sunset, Lakeview Area	Lost Hills	Coalinga	Wheeler Ridge	Santa Maria Val. (Union Oil, Sept. 1 '39)
14-14.9	$0.65	$0.64	$0.63	$0.64	$0.65	$0.61	....	$0.65	$0.61	$0.61	$0.62	$0.63	....	....	....	$0.60	$0.60	$0.60	$0.60	$0.60	....	$0.42
15-15.9	.65	.64	.63	.64	.65	.61	....	.65	.61	.61	.62	.63	....	....	....	.60	.60	.60	.60	.60	....	.44
16-16.9	.65	.64	.63	.64	.65	.61	....	.65	.61	.61	.62	.63	....	....	....	.60	.60	.60	.60	.60	....	.45
17-17.9	.65	.64	.63	.68	.65	.61	....	.65	.61	.61	.62	.63	....	....	....	.60	.60	.60	.60	.60	....	.46
18-18.9	.65	.64	.63	.71	.65	.65	....	.68	.61	.61	.62	.63	....	....	....	.60	.60	.60	.60	.60	....	....
19-19.9	.69	.64	.67	.75	.70	.69	....	.72	.61	.65	.62	.63	....	....	....	.60	.64	.64	.64	.61	$0.60	....
20-20.9	.73	.64	.72	.79	.76	.74	....	.75	.65	.69	.62	.67	....	....	....	.60	.69	.69	.69	.62	.60	....
21-21.9	.78	.64	.76	.82	.81	.78	....	.79	.69	.73	.62	.72	$0.63	....	....	.64	.74	.74	.74	.66	.60	....
22-22.9	.82	.69	.81	.86	.86	.82	....	.82	.73	.77	.66	.76	.63	....	....	.68	.79	.79	.78	.70	.63	....
23-23.9	.86	.75	.85	.89	.92	.86	$0.71	.86	.78	.82	.71	.81	.67	....	....	.71	.84	.84	.82	.74	.67	....
24-24.9	.90	.80	.90	.93	.97	.90	.77	.89	.82	.86	.75	.85	.72	....	....	.75	.89	.89	.86	.78	.71	....
25-25.9	.95	.86	.94	.96	1.02	.95	.82	.93	.86	.90	.80	.89	.77	....	....	.79	.94	.94	.90	.82	.75	....
26-26.9	.99	.91	.99	1.00	1.08	.99	.88	.96	.90	.94	.84	.94	.82	....	....	.83	.99	.99	.95	....	....	....
27-27.9	1.03	.97	1.03	1.04	....	1.03	.94	1.00	.94	.98	.89	.98	.87	$0.83	$0.92	.87	1.04	1.04	.99	....	....	....
28-28.9	1.07	1.02	1.07	1.07	....	1.07	.99	1.03	.98	....	.93	1.02	.91	.86	.96	.91	1.09	1.09	1.03	....	....	....
29-29.9	1.10	1.07	1.11	1.10	....	1.10	1.04	1.06	1.02	....	.98	1.06	.96	.90	.99	.95	1.14	1.14	1.07	....	....	....
30-30.9	1.14	1.12	1.15	1.14	....	1.14	1.09	1.09	....	....	1.02	1.10	1.01	.94	1.02	.99	1.19	1.19	1.11	....	....	....
31-31.9	....	....	....	1.17		1.17	1.14	Elwood Terrace			1.07	1.14	1.05	.98	1.06	1.02	1.24	1.24				....
32-32.9	....	....	....	1.20		1.20	1.19	F. o. b. ship.			1.11	1.18	1.09	1.02	1.09	1.06	1.29	1.29	Kettleman Hills			....
33-33.9	....	....	....	....		....	1.24	....	$1.21	....	1.15	1.22	1.14	1.06	1.13	1.10	1.34	1.34	....	$1.12	....	....
34-34.9	....	....	....	....		....	1.29	....	1.25	....	1.20	1.26	1.19	1.10	1.16	1.14	....	....	....	1.17	....	....
35-35.9	....	....	....	....		....	1.34	....	1.29	....	1.24	....	1.23	1.14	1.20	....	....	....	....	1.21	....	....
36-36.9	....	....	....	....		....	1.39	....	1.33	....	1.28	....	1.27	1.18	1.23	....	....	....	....	1.25	....	....
37-37.9	....	....	....	....		....	1.44	....	1.37	....	1.33	....	1.31	1.22	1.26	....	....	....	....	1.29	....	....
38-38.9	....	....	....	....		....	1.49	....	....	....	1.37	....	1.36	1.25	1.30	....	....	....	....	1.33	....	....
39-39.9	....	....	....	....		....	1.54	....	....	....	1.42	....	....	1.29	1.34	....	....	....	....	1.38	....	....
40-40.9	....	....	....	....		....	1.59	....	....	....	1.46	....	....	1.33	1.37	....	....	....	....	....	....	....
41-41.9	....	....	....	....		....	....	....	....	....	1.50	....	....	1.37	1.40	....	....	....	....	....	....	....
42-42.9	....	....	....	....		....	....	....	....	....	1.54	....	....	1.41	1.44	....	....	....	....	....	....	....
43-43.9	....	....	....	....		....	....	....	....	....	1.59	....	....	1.45	1.47	....	....	....	....	....	....	....
44-44.9	....	....	....	....		....	....	....	....	....	1.63	....	....	1.49	1.51	....	....	....	....	....	....	....
45-45.9	....	....	....	....		....	....	....	....	....	1.67	....	....	1.53	1.54	....	....	....	....	....	....	....
46-46.9	....	....	....	....		....	....	....	....	....	1.71	....	....	1.57	1.57	....	....	....	....	....	....	....
47-47.9	....	....	....	....		....	....	....	....	....	....	....	....	1.61	....	....	....	....	....	....	....	....
48-48.9	....	....	....	....		....	....	....	....	....	....	....	....	1.64	....	....	....	....	....	....	....	....

FOB Standard Pipeline

*El Segundo prices same as Signal Hill. Wilmington prices same as Signal Hill, except below 19 gravity prices are: 14-16.9, $0.60; 17-17.9, $0.62; 18-18.9, $0.64.
**Includes Newhall, McKittrick, Kern River, Round Mountain and Kern Front, schedule for which ends with 19-19.9. Mountain View schedule begins with 19-19.9.

LOUISIANA-ARKANSAS

Posted by S. O. Louisiana, Oct. 17, '40

Gravity	Bunkie, La. etc.	Caddo, La. etc.	Darrow, La. etc.	University, La. (Baton Rouge)	Atlanta, Ark. etc.
Below 21	....	....	$0.75	$0.91	$0.55
21-21.9	....	....	.77	.93	.57
22-22.9	....	....	.79	.95	.59
23-23.9	....	....	.81	.97	.61
24-24.9	....	....	.83	.99	.63
Below 25	$0.83	$0.73	....	....	....
25-25.9	.85	.75	.85	1.01	.65
26-26.9	.87	.77	.87	1.03	.67
27-27.9	.89	.79	.89	1.05	.69
28-28.9	.91	.81	.91	1.07	.71
29-29.9	.93	.83	.93	1.09	.73
30-30.9	.95	.85	.95	1.11	.75
31-31.9	.97	.87	.97	1.13	.77
32-32.9	.99	.89	.99	1.15	.79
33-33.9	1.01	.91	1.01	1.17	.81
34-34.9	1.03	.93	1.03	1.19	.83
35-35.9	1.04	.94	1.04	1.20	.84
36-36.9	1.05	.95	1.05	1.21	.85
37-37.9	1.06	.96	1.06	1.22	.86
38-38.9	1.07	.97	1.07	1.23	.87
39-39.9	1.08	.98	1.08	1.24	.88
40 & above	1.09	.99	1.09	1.25	.89

Bunkie, La. schedule includes Eola and Olla, La.

Caddo, La. schedule includes De Soto, Homer, Sabine & Sugar Creek, La., Fouke & Miller County, Ark.

Darrow, La. schedule includes, Bayou des Glaise, Bayou Mallet, Choctaw, Jeanerette, Lirette, No. Crowley, Port Barre, Potash, Roanoke & St. Martinville, La.

Atlanta, Ark. schedule includes Buckner, Magnolia, Village & Schuler (Jones Sand Oil), Ark.

Cotton Valley:
Crude..... $1.05
Distillate..... 1.10
Holloway Sand
Crude..... 1.10
Rodessa..... $1.05
Shreveport (Cross Lake)..... 1.05
Smackover (Heavy) .73
Dorcheat, Big Creek, & McKamie (Sour Distillates)..... .95

(Continued in next column)

LOUISIANA-ARKANSAS (Cont'd)

Posted by Shell Oil Co., Inc. (Aug. 29, '39)
Iowa District, La.

Below 18..$0.75	23-23.9..$0.89	29-29.9..$1.04
18-18.9.. .77	24-24.9.. .92	30-30.9.. 1.06
19-19.9.. .79	25-25.9.. .95	31-31.9.. 1.08
20-20.9.. .81	26-26.9.. .98	32-32.9.. 1.10
21-21.9.. .83	27-27.9.. 1.00	33-33.9.. 1.12
22-22.9.. .86	28-28.9.. 1.02	34 & above 1.14

Black Bayou & White Castle Districts, La.—same as Iowa District, except Black Bayou, etc. begins with Below 20 at $0.79.

Gibson Field, Terrebonne Parish, La.....$1.04
Happytown Field, St. Martin, Parish, La.
(Jan. 12, '40)..... 1.00

Posted by Arkansas Fuel Oil Corp.
Urania, La. (Oct. 14, '38).....$0.89

Posted by Continental Oil Co.
Tepetate & Ville Platte, La. (Oct. 11, '38)....$1.03

Abbeville, La. (Jan. 1, '39)

Below 36..$0.92	37-37.9..$0.96	39-39.9..$1.00
36-36.9.. .94	38-38.9.. .98	40 & above 1.02

Posted by Caddo Crude Oil Purchasing Corp.
Allison area, Shrv'prt. field (Aug. 14, '39).....$0.95

Lisbon, N. La. (Sept. 14, '39)

27-27.9..$0.66	30-30.9..$0.72	33-33.9..$0.78
28-28.9.. .68	31-31.9.. .74	34-34.9.. .80
29-29.9.. .70	32-32.9.. .76	35 & above .82

CANADIAN FIELDS

Posted by Imperial Oil Limited
Western Ontario (Nov. 6, 1939)

Petrolia.....$2.10 Oil Springs.....$2.17

Turner Valley (Prices FOB producer's tankage)
Crude Oil (Sept. 12, 1940)

33-33.9..$1.08	44-44.9..$1.30	55-55.9..$1.52
34-34.9.. 1.10	45-45.9.. 1.32	56-56.9.. 1.54
35-35.9.. 1.12	46-46.9.. 1.34	57-57.9.. 1.56
36-36.9.. 1.14	47-47.9.. 1.36	58-58.9.. 1.58
37-37.9.. 1.16	48-48.9.. 1.38	59-59.9.. 1.60
38-38.9.. 1.18	49-49.9.. 1.40	60-60.9.. 1.62
39-39.9.. 1.20	50-50.9.. 1.42	61-61.9.. 1.64
40-40.9.. 1.22	51-51.9.. 1.44	62-62.9.. 1.66
41-41.9.. 1.24	52-52.9.. 1.46	63-63.9.. 1.68
42-42.9.. 1.26	53-53.9.. 1.48	64 & over 1.70
43-43.9.. 1.28	54-54.9.. 1.50	

Absorption Gasoline (Jan. 5, 1938)
90% Rec., 20 lb. Reid v.p.....$1.94
90% Rec., 17 lb. Reid v.p.....$2.08

ROCKY MOUNTAIN FIELDS

Posted by Stanolind Oil & Gas Co. (Oct. 11, '38)

Salt Creek (except Tensleep crude), Midway and Dutton Creek, Wyo., same schedule as S. O. Indiana posts in Okla.-Kans., ranging from $0.86 to $1.10, which see in next column.

Tensleep crude....$0.646
Iles, heavy..... .92
Elk Basin, light... .90
Grass Creek, light. .90
Frannie, light.....$0.55
Grass Creek, heavy .40
Hamilton Dome, Wyo..... .35
Frannie, heavy..... .42

Posted by Ohio Oil Co. (Oct. 11, '38)

Elk Basin, Wyo.. $0.90
Grass Creek, light. .90
Rock Creek.....$1.00
Lance Creek..... .77
Dry Creek, Mont..... .92
Grass Creek, heavy (April 1, '39)..... .40
Sunburst, Mont. (Nov. 16, '37)..... .90

Posted by Continental Oil Co. (Oct. 11, '38)
Ft. Collins & Wellington, Col.

Below 29..$0.81	32-32.9..$0.89	36-36.9..$0.97
29-29.9.. .83	33-33.9.. .91	37-37.9.. .99
30-30.9.. .85	34-34.9.. .93	38-38.9.. 1.01
31-31.9.. .87	35-35.9.. .95	39-39.9.. 1.03
		40 & above 1.05

Canon City & Florence, Col.....$0.90
Cat Creek, Mont.. 1.10
Big Muddy, Wyo..$0.98
Lance Creek, Wyo. 0.77

CLASSIFIED

Address all Blind Box Number ads to National Petroleum News, 530 Penton Building, Cleveland, Ohio, unless otherwise specified.

For Sale

DEPARTMENT OF THE INTERIOR CALL FOR BIDS TO PURCHASE ROYALTY OIL ACCRUING TO THE UNITED STATES FROM THE SALT CREEK, WYOMING, OIL FIELD. Sealed proposals, in duplicate, will be received in the office of the Secretary of the Interior, Washington, D. C., on or before noon, November 15, 1940, from responsible bidders for the purchase, beginning January 1, 1941, of royalty oil accruing to the United States from Government lands in the Salt Creek, Wyoming, oil field. Detailed specifications on quantities offered for sale, required form of bids, deliveries, volume measurements, gravity determinations, bond requirements, and action on bids, should be obtained by prospective bidders from the Director, Geological Survey, United States Department of the Interior, Washington, D. C., the Supervisor, United States Geological Survey, Casper, Wyoming, or the Register, United States Land Office, Cheyenne, Wyoming. Sealed bids are to be submitted to the Secretary of the Interior, Washington, D. C., pursuant to the specifications, the envelope to be marked plainly "Bid on Salt Creek Royalty Oil—Not to be Opened Before Noon, November 15, 1940." No bid received after the time fixed herein for submitting bids will be considered. The right is reserved to reject all bids received pursuant to this advertisement whenever in the judgment of the Secretary of the Interior the interest of the United States demands. (Sgd.) A. J. Wirtz, Acting Secretary of the Interior.

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American Can Co.
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Bowser & Co., S. F.
Bradford Oil Refining Co.
Brodie Co., Inc., Ralph N.
Buckeye Iron & Brass Works 2
Butler Manufacturing Co.

Canfield Oil Co.
Champion Spark Plug Co. 31
Champlin Refining Co.
Chek-Chart Corp.
Chevrolet Motor Division, General Motors Sales Corp.
Chicago Bridge & Iron Co.
Chiksan Oil Tool Co., Ltd.
Cincinnati Advertising Products Co. Pump Globe Division
Cincinnati Mfg. Co.
Cities Service Oil Co. 33
Columbian Steel Tank Co.
Continental Can Co.
Crown Can Co. 10
Curtis Pneumatic Machinery Co.

Davidson Enamel Products, Inc.
Davidson Porcelain Enamel
Davis Welding & Mfg. Co. Inside Back Cover
Deep Rock Oil Corp.
Delco Products
Delco-Remy 1
Dodge Division (Chrysler Motors)
Dykem Co.
Du Pont de Nemours & Co., E. I. 8

Econo-vent Corp.
Erie Meter Systems, Inc.
Ethyl Gasoline Corp. 6, 7

Farrell Mfg. Co.
Fleet-Wing Corp.
Ford Motor Co.
Freedom Oil Co.
Fruehauf Trailer Co.

General American Transportation Corp. 38
General Electric Co.
General Motors Truck & Coach Division 26
Giant Tire & Rubber Co.
Gilbert & Barker Mfg. Co.
Goodrich Co., B. F.
Goodyear Tire & Rubber Co.
Granberg Equipment, Inc.
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Pure Oil Co

Quaker State Oil Refining Co.

Reeves Brothers, Inc.
Republic Oil Co.
Roper Corp., Geo. D. 37

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Sinclair Refg. Co., Inc.
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Standard Steel Works
Stewart-Warner Corp.
Sun Oil Co. Outside Back Cover

Texaco Development Corp.
Thornton Tandem Co.
Tidewater Associated Oil Co.
Tokheim Oil Tank Co.

Universal Oil Products Co. 19

Viking Pump Co.

Wayne Pump Co. 4
Westinghouse Electric & Mfg. Co.
Wheeling Corrugating Co.
White Motor Co.
Witte Engine Works

· PERSONALS ·

Russell Cantwell, Tulsa, has resigned as a member of the Independent Petroleum Assn. of America staff to become vice-president of Aero Exploration Co., headquartered in Tulsa.

* * *

Leslie Cockrell of the Texas Co.'s Davenport, Okla. gasoline plant has been awarded the President's Medal, presented by the National Safety Council.

Mr. Cockrell saved the life of Pete Sukovatty, 8-year-old youngster who was overcome when he swallowed gasoline. The Texaco employe applied artificial respiration and his promptness saved the boy's life. He is the only Texaco employe in the Oklahoma-Kansas-Illinois-Kentucky division who has received this honor.

* * *

"Westward Ho" . . . was the theme for **G. J. "Jerry" Le Pine,** Chicago, treasurer of Transamerican Petroleum Co., and his wife on their vacation recently. Yellowstone Park, Boulder Dam, Grand Canyon, and the glorious city of Los Angeles (plug for the Chamber of Commerce) were some of the main points of interest.

* * *

Fisherman **H. W. Camp** is mighty proud of this string of small-mouth bass which he caught while drifting down Oklahoma's White river. Mr. Camp, manager of Cities Service Oil Co.'s refining division at Bartlesville, "pooh-poohs" his oil men friends who whip off to Minnesota and other distant waters to pursue the ancient sport. For the benefit of cynics, this fisherman points out that above are neither catfish nor pike.

With the dissolution of Petroleum Sales Co., **A. V. Bourque,** Tulsa, former president of the sales company, announces the formation of his own company under the name A. V. Bourque, Inc. Mr. Bourque's new concern will do a general marketing business in petroleum and its products. Offices of the new company are located at Tulsa.

* * *

H. G. Shaw, Wichita, traffic manager and purchasing agent of Vickers Petroleum Co., is in a Wichita hospital with an attack of rheumatism. The Vickers executive has been with the organization 22 years, and if you give the password, the Vickers PBX operator can switch your call to a phone at Mr. Shaw's bedside. "They've got me down, but I'm sure not out," he told NPN.

* * *

Records don't show who pinned a Lincoln button on **John A. Jones,** rock-ribbed New York republican from rock-ribbed Allegany county. But it is known that **John P. Herrick,** former oil producer and newspaper publisher at Bolivar, N. Y., pinned a Willkie button on this 100-year-old Lincoln supporter, who has voted for every republican presidential candidate since "Honest Abe" gave the country its first "new deal".

* * *

F. A. Stivers, Tulsa, vice-president and general superintendent of Texas-Empire Pipe Line Co., has been elected president of the Tulsa area council of Boy Scouts. He succeeds Robert S. Ellison, retired president of Stanolind Pipe Line Co. and Stanolind Oil Purchasing Co., who is leaving Tulsa.

* * *

"Two spades . . . I'll double it . . . how many cards do you want" . . . and, "I'll bump you again" . . . was the general trend of conversation at the Chicago Oil Men's Club fall dinner and bridge party Nov. 7.

About 65 Chicago oil men and guests waded through juicy steaks and trade talk and then broke up into 3 groups to play bridge (auction or contract) and poker (decide-on-your-own-rules-before-you-start variety).

M. S. Becker, Sun Oil Co., was the lucky winner of the door prize — a smart set of matched luggage. **J. T. McDowell,** Cities Service Oil Co., and **W. G. "Bill" Franke,** sales manager, American Mexican Petroleum Co., were the high point men in contract bridge. McDowell, expecting cold winter nights, picked out a heavy wool blanket for his prize, while "Bill" took playing cards.

H. George Donovan, Globe Oil & Refining Co., came through with second honors to win a light tan golf sweater, while close behind these leaders were **Harry Lightstone,** Kanotex Refining Co., who took an electric clock and **C. J. Wood,** Harry P. Dunn Co., who favored a Travalarm . . . a new name for a traveling alarm clock.

In the poker division, **Kenneth H. Ward,** Amco Corp., was the top man, and he rightfully chose a traveling poker kit for his prize. A pressure cooker was the choice of **M. W. Prellberg,** James B. Berry Sons' Co. The entire get-together was handled by Mr. Franke and **Holger Jensen,** Spencer Petroleum Co.

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E. M. Skeehan, oldest man in point of service in the Barnsdall Oil Co., returns to Tulsa as treasurer of his company. Before his appointment as treasurer, he was general auditor stationed at the company's Los Angeles offices.

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Clarence P. Hornung, New York, industrial designer, has been retained by Richfield Oil Corp., to re-style oil cans, drums, package goods, trademarks and station signs.

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"Economic Problems of the Petroleum Industry" was the topic recently discussed by **Dr. Norman D. Fitz Gerald,** New York, department of Petroleum Economics, Chase National Bank, before more than 100 executives of The Texas Corp.

Mr. Fitz Gerald said that the excellent position of the petroleum industry, in relations to national defense, was partly dependent on its vertically integrated form of organization which has been attacked in the federal anti-trust suit, filed Sept. 30 by the Justice Department.

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James E. Auten, president of Barber Asphalt Corp., has announced the appointment of **Ralph L. Gesner** as manager of gasoline and fuel oil sales, and the appointment of **H. C. Hottel** as manager of industrial asphalt sales.